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**A CONTRIBUTION TO THE KNOWLEDGE OF THE ORTHOPTERA OF MONTANA,  
YELLOWSTONE PARK, UTAH AND COLORADO.**

BY JAMES A. G. REHN AND MORGAN HEBARD.

During the month of August, 1904, the junior author was occupied in collecting Orthoptera at a number of localities extending from eastern Montana to Salt Lake City, and from that locality to east-central Colorado. Collecting at some localities was limited to a few minutes search permitted by the stoppage of the train, at other localities several days were spent and very extensive and interesting collections made. The careful study of the Orthoptera of the Yellowstone Park and of Pike's Peak yielded some interesting and scarce species, as well as two new forms and a considerable amount of information on the habitat and actions of a number of species.

The number of specimens in the collection studied is about 2,800, and 121 species are represented. Notes on the habits and other information has been given under most of the species by the collector, and the chief localities visited have been briefly described, to aid in a proper understanding of their conditions and environmental features as well as to aid future students in this region.

A considerable representation of the species treated in this paper has been placed in the Academy's collection by the junior author.

MONTANA.

*Waco, Yellowstone Co.*, elevation 2,700 feet. On the sage-brush plains just east of the foothills of the Rockies.

*Grey Cliff, Sweetgrass Co.*, elevation 3,900 feet. In a more rugged character of country than Waco but with a similar vegetation. Orthoptera appeared to swarm as the specimens collected were taken in less than two minutes.

*Billings, Yellowstone Co.*, elevation 3,115 feet. Specimens taken here were from the dusty main street of the town.

*Livingston, Park Co.*, elevation 4,488 feet. Material from this locality was taken among weeds growing in a vacant lot near the station.

*Emigrant, Daileys, Sphinx and Electric, Park Co.*, elevation 4,800-

5,100 feet. During the brief stops made by the train between Livingston and Gardiner a little collecting was possible. These stations are situated in the valley of the Yellowstone river between the Snowy Mountains and the Gallatin Range. The vegetation is chiefly sage-brush and other plants which grow in a semi-arid soil. Orthoptera were very plentiful, and had time allowed a great quantity could easily have been taken.

*Muir, Bozeman Tunnel, Park Co.*, elevation 5,496 feet. At this point a few minutes' stop afforded an opportunity to collect in the heavy growth of weeds and grasses along the track. The vegetation was very luxuriant and wholly different from that found in the semi-arid sections. The Orthoptera of regions of this character was always much less abundant than in the sage-brush country.

*Three Forks, Willow Creek and Sappington, Gallatin Co., and Jefferson City and Whitehall, Jefferson Co.*, elevation 4,061–4,529 feet. During the brief stops made at these towns a few specimens were taken. The soil was barren and Orthoptera was far less plentiful than in the more eastern portion of the State.

*Spire Rock, Jefferson Co.*, elevation 5,217 feet. Among the great boulders on the summit of the mountains near Butte a few specimens were seen and hardly any vegetation found. This locality was by far the most desolate of any at which collecting was done.

#### YELLOWSTONE PARK.

*Mammoth Hot Springs*, elevation 6,215–7,000 feet. At Fort Yellowstone, where the Mammoth Hot Springs are situated, a great variety of collecting grounds are within easy reach. About the fort itself, among the weeds and grasses, Orthoptera were not very plentiful; but immediately behind the hotel, in the dense sage-brush growing on the sides of the foothills, vast quantities of Orthoptera of many species were to be found. Collecting here was somewhat difficult owing to the steep hillside and the agility of the majority of the species, as well as the difficulty of following more interesting specimens on account of the quantities of more common species which everywhere swarmed. At a greater elevation on the sides of these hills the sage-brush gave place somewhat to grasses and other low growing plants, where Orthoptera were less prevalent but more desirable. On the summits, however, the ground was pebbly and overgrown with sparse and stunted grasses, in which situations many most desirable species were abundant and could be easily taken in the scanty vegetation. In one grassy hollow near the top of the foothills, among scattered bushes near a thicket

of aspen, I found species which did not seem present in the surrounding sections, among which were *Hippiscus maculatus*, *Circotettix rabula*, *Bradynotes obesa* and *Melanoplus alpinus*.

At the head of the hot springs I found a plot of marsh grass among the stunted pines which revealed several species of crickets and other Orthopterous insects not found in the surrounding country. On the summits of the higher foothills nearby an even greater variety of the more interesting forms were found.

*Apollinaris Spring*, elevation 7,250 feet. Material collected here was from dense pine woods.

*Fountain, Lower Geyser Basin*, elevation 7,230 feet. Very few specimens could be found here, the pine woods nearby revealing nothing whatever, while but very few individuals were taken on the geyser formation and in the short grass near the hotel. This was the most unfavorable locality found in the Park.

*Old Faithful Inn, Upper Geyser Basin*, elevation 7,830 feet. Here two distinct collecting localities were accessible in which few though interesting forms were found. Between Old Faithful geyser and the Firehole river a space of short grass contained numerous *Arphia pseudonietana*, while on the surrounding geyser formations the same species could be found in very small numbers. Back of the Inn, among the short but thickly-growing pines, several species of *Melanoplus* (*M. bruneri* and *fasciatus*) were found which were not met with elsewhere in the Park. Unlike most of the Yellowstone localities, long and diligent search was required to secure each specimen.

*Norris Pass, Continental Divide*, elevation 8,240–8,320 feet. About the Norris Pass the vegetation was scanty owing to the elevation. In the more open spaces a short grass grew plentifully and several species of Orthoptera could have been taken in numbers had time permitted.

*The Thumb, Yellowstone Lake*. About The Thumb on the shore of Yellowstone Lake the vegetation was heavy, but owing to the few cleared spaces but few Orthoptera were found.

*Exit of the Yellowstone River*, elevation 7,742 feet. At this point above the high abrupt bank on the left side is a large treeless expanse covered by high plants and shrubs. In this location all forms of insect life were very plentiful, and many varieties of boreal Lepidoptera were noticed. The Orthoptera of this section differed materially from that found in the more arid geyser regions.

*Mud Volcano*, elevation 7,740 feet. Collecting here was done on sandy soil.

*Near Grand Cañon*, elevation 8,000 feet. The country about the

Grand Cañon much resembled that about Yellowstone Lake, but Orthoptera were less abundant. As in other parts of the Park, very few specimens could be found in the woods.

#### UTAH.

*Vicinity of Salt Lake City, Salt Lake Co.*, elevation 4,230–6,000 feet. About Salt Lake City I found the vicinity of Ensign Peak (top 6,000 feet elevation) by far the most productive collecting ground. There the soil was dry and gravelly, but covered with a somewhat sturdy growth of sage-brush and other desert plants. In this place Orthoptera swarmed and great difficulty was experienced in following scarce specimens among the legions of less desirable ones. About the foot of the hill was the most productive situations, but great numbers were found both on the hillside and at the top.

In a dry field of cut alfalfa some miles south of the city (elevation 4,230 feet) collecting was profitable among the stubble, although both there and in the surrounding country far fewer species were to be found than was expected and nothing of the variety found in the more barren region about Ensign Peak.

#### COLORADO.

*Grand Junction, Mesa Co.*, elevation 4,573 feet. In the dry sandy country at this locality quite good collecting was found, though recent freshets had washed over much of the ground, and the only vegetation in most places consisted of tall scraggy bushes.

*Antlers, Garfield Co.*, elevation 5,310 feet. An area of cactus and sage at this locality proved very productive in the few minutes spent there.

*Debeque, Mesa Co.*, elevation 4,935 feet, and *Newcastle, Garfield Co.*, elevation 5,552 feet. Both localities in the rather arid cañon of the Grand River.

*Vicinity of Colorado Springs, El Paso Co.* To the east of the city in the prairie (elevation about 6,000 feet) Orthoptera were present in countless numbers. The true prairie-grass land revealed many species, while the more luxuriant grass about a small stagnant pond produced other species. This locality, while somewhat dry, was nothing like the parched sage-brush plains in which collecting was done at other places. Austin Bluffs (elevation 6,960 feet) rise abruptly from the prairie land, many dry shrubs growing upon them, plentifully interspersed with scrub pines.

*Vicinity of Manitou, El Paso Co.* The mesa (elevation 6,400 feet)

at this locality was somewhat like the prairie at Colorado Springs, but not nearly as productive. On the hillside near the Pike's Peak railroad station (elevation 6,700 feet) Orthoptera were plentiful among the high grasses and scrub oak thickets. The Garden of the Gods (elevation 6,300 feet) proved everywhere unproductive except a small field of tall grass near the Manitou street-car line. Many species were to be found here in numbers.

*Pike's Peak.* The summit of Pike's Peak (elevation 14,147 feet) is a mass of huge boulders with no apparent vegetation. The region about Windy Point (12,000–12,300 feet) is treeless and very steep. A short but sturdy grass grows everywhere that the quantity of huge jagged rocks permit, and in this grass a few species of Orthoptera such as *Gomphocerus clavatus*, *Melanoplus altitudinum*, *fasciatus* and *monticola* were quite plentiful.

Along the timber-line (11,578 feet) in the stunted vegetation Orthoptera were somewhat more varied, but not as interesting as those at Windy Point. At Middle Hudsonian (elevation 10,500 feet) and above the pump station (elevation 10,100 feet) the forest of quaking aspen was exceedingly unproductive and very few specimens were seen. In Dark Cañon (elevation 8,900–9,000 feet) in spite of an abundance of grass few Orthoptera could be found, although other forms of insect life were plentiful. On the densely wooded upper slope of Dark Cañon work was attended with less success than in the burned-over forest.

*Cripple Creek, Teller Co.*, elevation 9,591 feet. The few specimens taken at Cripple Creek were from the tailings about the mines.

*Fort Morgan, Morgan Co.*, elevation 4,338 feet. A rank growth of weeds along the railroad track at this place swarmed with Orthoptera, and in a few minutes a number of interesting forms were taken.

#### MANTIDÆ.

##### LITANEUTRIA Saussure.

*Litaneutria minor* (Seudder).

Antlers, Colorado, Aug. 15, 1 immature ♀.

This specimen is referred to this species with some uncertainty, as it may represent *L. borealis* Bruner, which, however, is of doubtful validity.<sup>1</sup>

This individual was taken on dry soil among dense beds of cactus and sage.

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<sup>1</sup> Vide Caudell, *Proc. U. S. Nat. Mus.*, XXVIII, pp. 463, 464.

**ACRIDIDÆ.****ACRYDIINÆ.****ACRYDIUM** Geoffroy.***Acrydium granulatum*** Kirby.

Hill at head of springs, Mammoth Hot Springs, Yellowstone Park, Aug. 5, 2 immature specimens.

Careful search revealed no mature specimens.

***Acrydium crassum*** (Morse).

Manitou, Colorado, 6,324 feet, Aug. 16, 3 ♂, 8 ♀; 6,700 feet, Aug. 23, 1 ♂, 1 ♀.

This species has previously been recorded from localities in northern and north-central Colorado: Fort Collins, Laporte, Steamboat Springs, Poudre river, Platte Canyon and Denver.

This species was found among the mountain-loving plants in the immediate vicinity of scrub oak bushes. It appeared to be extremely local, for I found it in but one small area, where, however, it was common.

**ACRIDINÆ.****SYRBULA** Stål.***Syrbula admirabilis*** (Uhler).

St. Louis, Missouri, Aug. 27, 18 ♂, 12 ♀.

These specimens are inseparable from New Jersey individuals.

A common species in the tall weeds of a vacant lot in the city.

**ACROLOPHITUS** Thomas.***Acrolophitus hirtipes*** (Say).

Mammoth Hot Springs, Yellowstone Park, 6,215 and 6,500 feet, Aug. 5, 2 ♂. Colorado Springs, Colorado, Aug. 18, 4 ♂, 9 ♀. Prairie land, Colorado Springs, Aug. 18, 1 ♀. Knob Hill, Colorado Springs, Aug. 17-22, 7 ♂, 13 ♀.

This series exhibits a great range of color variation, extending from the typical blotched form to the uniform one tentatively named *uniformis* by Bruner.<sup>2</sup> The latter does not appear worthy of recognition, as the extremes and intermediates are present in both the larger series examined.

This species was quite scarce on the hillsides about the Mammoth Hot Springs, being found among sage and mountain plants. On the prairie outside of Colorado Springs the species was extremely plentiful and

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<sup>2</sup> *Biol. Cent.-Amer.*, Orth., II, p. 47.

easily captured. The insect is not swift of flight and often relies on its strongly protective coloration to escape detection.

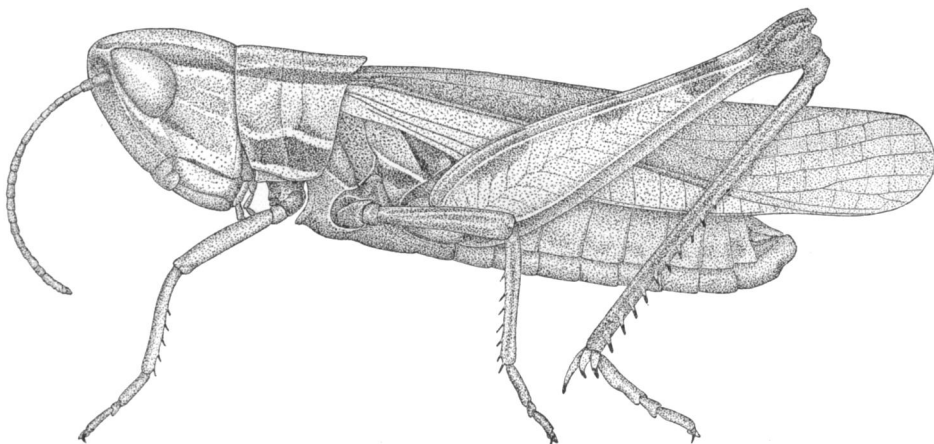


Fig. 1.—*Akentetus unicolor* McNeill. Knob Hill, Colorado Springs, Colorado. Lateral view of male. ( $\times 5$ .)

**AKENTETUS** McNeill.

*Akentetus unicolor* McNeill.

Mammoth Hot Springs, Yellowstone Park, Aug. 5, 1 ♀. Knob Hill, Colorado Springs, Colorado, Aug. 17, 2 ♂. Akron, Washington Co., Colorado, Aug. 24, 1 ♂.

This scarce species, previously recorded only from the type locality ("Colorado") and Lakin, Kansas, is also represented in the Academy collection by a male from Nebraska and a female from Livermore, Larimer Co., Colorado, the latter taken July 23, 1899. The pattern of coloration is very similar to that of *Amphitornus*, but the longitudinal bars are narrower. In the Akron and Mammoth Hot Springs specimens the postocular regions are distinctly infusate. The bars on the caudal femora are distinct in all the specimens examined.

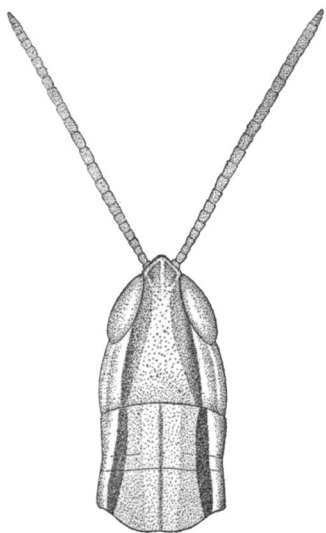


Fig. 2.—*Akentetus unicolor* McNeill. Knob Hill, Colorado Springs, Colorado. Dorsal view of head and pronotum of male. ( $\times 5$ .)

The four specimens of this species taken were captured in three decidedly different locations. At Mammoth Hot



Springs one was taken on the hillside among sage-brush. At Knob Hill two were captured on the prairie, while at Akron it was taken in a dry situation near the railroad.

**AMPHITORNUS** McNeill.

**Amphitornus coloradus** (Thomas).

1872. *S[tenobothrus] bicolor* Thomas, Prelim. Rep. U. S. Geol. Sur. Montana, p. 465.<sup>3</sup>

1873. *S[tenobothrus] coloradus* Thomas, Synopsis Acrid. N. Amer., p. 82.

Mammoth Hot Springs, Yellowstone Park, Aug. 5, 4 ♀, 1 nymph. Summit of foothills near Mammoth Hot Springs, 6,500 feet, Aug. 5, 3 ♀. Hill at head of Mammoth Hot Springs, 7,000 feet, Aug. 5, 1 ♀. Salt Lake City, Utah, Aug. 13, 1 ♀. Hill near Salt Lake City, 4,700 feet, Aug. 13 and 14, 3 ♂, 2 ♀. Knob Hill, Colorado Springs, Colorado, Aug. 17-22, 4 ♂, 1 ♀. Prairie land, Colorado Springs, Aug. 18, 1 ♀.

The series examined contains both the typical form and the suffused form called "Var. *a*" by Thomas. This is apparently the first record of the species from Utah.

This species was found in Wyoming, Utah and Colorado in almost the same numbers. Each specimen seen was captured, if that was in any way possible. The insect was found among the sage on hillsides and also among the grasses of the prairie.

**OPEIA** McNeill.

**Opeia obscura** (Thomas).

Salt Lake City, Utah, Aug. 13, 1 ♀. Colorado Springs, Colorado, Aug. 18, 1 ♀. Knob Hill, Colorado Springs, Aug. 17-22, 65 ♂, 62 ♀. Prairie land, Colorado Springs, Aug. 18, 2 ♂, 2 ♀. Garden of the Gods, Colorado, Aug. 19, 1 ♂.

Specimens of this species were received from Prof. C. P. Gillette from Merino, Lamar, Snyder and Fort Collins, Colorado, labelled *Eritettix variabilis* with a query. The Salt Lake City specimen is apparently the first recorded west of the Rockies.

About Colorado Springs on the prairie this species was to be found in countless numbers. The males are very rapid in their movements, but so common were they that sometimes over a dozen would be taken with one sweep of the net.

**CORDILLACRIS** Rehn.

**Cordillacris occipitalis** (Thomas).

Colorado Springs, Colorado, Aug. 18, 1 ♀. Knob Hill, Colorado

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<sup>3</sup> Invalidated by *Stenobothrus bicolor* (Charpentier), the combination dating from Sélys-Longchamps, 1868 (*Ann. Soc. Entom. Belg.*, XI, p. 31).

Springs, Aug. 18-22, 1 ♂, 2 ♀. Austin Bluffs, Colorado Springs, Aug. 18, 8 ♂, 6 ♀. Prairie land, Colorado Springs, Aug. 18, 1 ♂.

This was an extremely scarce species on the grassy prairie, but among the low plants growing in a forest of dwarf pines on Austin Bluffs it was quite common. The insects spring about rapidly and are also able to fly well.

***Cordillacris cinerea*** (Bruner).

Sphinx, Park Co., Montana, Aug. 4, 1 ♂. Austin Bluffs, Colorado Springs, Colorado, Aug. 18, 2 ♀.

This form appears to be hardly separable from the preceding.

The male captured was taken in the sage-brush. So rapidly did it jump about that several minutes were occupied in making the capture, as I had no net at the time.

***Cordillacris crenulata*** (Bruner).

Antlers, Garfield Co., Colorado, Aug. 15, 2 ♀. Colorado Springs, Colorado, Aug. 18, 1 ♀. Knob Hill, Colorado Springs, Aug. 17-22, 8 ♂, 10 ♀. Austin Bluffs, Colorado Springs, Aug. 18, 1 ♀. Garden of the Gods, Aug. 17 and 19, 1 ♂, 3 ♀.

This species was quite plentiful in the grass of the prairie outside Colorado Springs. It was also taken among cactus and sage, in a damp grassy meadow and among the low scattered plants growing in a forest of dwarf pines.

**PHLIBOSTROMA** Seudder.

***Phlibostroma quadrimaculatum*** (Thomas).

Colorado Springs, Colorado, Aug. 18, 2 ♂, 2 ♀. Knob Hill, Colorado Springs, Aug. 17-22, 56 ♂, 39 ♀. Manitou, Colorado, Aug. 23, 1 ♀. Garden of the Gods, Colorado, Aug. 17-23, 8 ♂, 5 ♀. Akron, Washington Co., Colorado, Aug. 24, 1 ♂, 1 ♀.

One of the extremely plentiful species found in the prairie. Hundreds could have been taken in a short time. Quite a diversity of coloration occurred in the specimens, for among those taken were both brown and green-marked individuals. The females were generally of the green form, while the males were more of the wholly brown type.

**ORPHULELLA** Giglio-Tos.

***Orphulella pelidna*** (Burmeister).

Knob Hill, Colorado Springs, Aug. 17-22, 5 ♂, 5 ♀.

The separation of *O. pratorum* from this form is a task apparently hopeless. For the present at least we prefer to call these *pelidna*, as *pratorum* as understood by us, on the basis of material from the south-

eastern States and New Jersey, appears to be slenderer with longer wings. However these differential characters are only averages, numerous specimens which cannot otherwise be separated from the usual *pratorum* type being intermediate in proportions.

The species was found in short marshy grass growing about a shallow pond in the prairie. Considerable search was required to find the ten specimens captured.

***Orphulella salina* Seudder.**

Grand Junction, Colorado, Aug. 15, 1 ♂.

This species has previously been recorded from Grand Junction and Montrose, Colorado, by Caudell,<sup>4</sup> and Grand Junction and Delta by Gillette.<sup>5</sup>

This specimen was taken in short grass near the Grand river, in a locality which had been recently inundated. No other specimens of Orthoptera were seen about this location.

**DICHRMORPHA** Morse.

***Dichromorpha viridis* (Seudder).**

Table Rock, Pawnee Co., Nebraska, Aug. 25, 1 ♂, 1 ♀. St. Louis, Missouri, Aug. 27, 2 ♀.

In both localities plentiful among thick grass and weeds.

**CHLOEALTIS** Harris.

***Chloëaltis abdominalis* (Thomas).**

Summit of foothill of Gallatin Range, Mammoth Hot Springs, Yellowstone Park, 7,000 feet, Aug. 5, 4 ♂, 7 ♀. Manitou, Colorado, 6,300–6,900 feet, Aug. 23, 7 ♂, 4 ♀.

The male individuals are inseparable from a specimen of the same sex from Pequaming, Michigan, while the females are similar to individuals of that sex from Manitoba and Truchas Peak, New Mexico. The Truchas Peak specimen is slightly smaller with rather slenderer caudal limbs.

This species was doubtfully recorded from Colorado by Cockerell<sup>6</sup> as taken at Willow Creek, Cusack Ranch, Custer County, in September.

At Mammoth Hot Springs I found this species in a small glade at the top of the foothills. Here in the thick grass growing about a clump of aspen the series listed above was taken with little difficulty. The males of this species are very quick and wary, but the females are

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<sup>4</sup> *Proc. U. S. Nat. Mus.*, XXVI, p. 782.

<sup>5</sup> *Bull. 94, Colo. Agr. Exp. Sta.*, p. 26.

<sup>6</sup> *Trans. Amer. Ent. Soc.*, XX, p. 337.

extremely heavy and slow, and appear to rely a great deal on their protective resemblance to a bit of twig. The stridulation of the

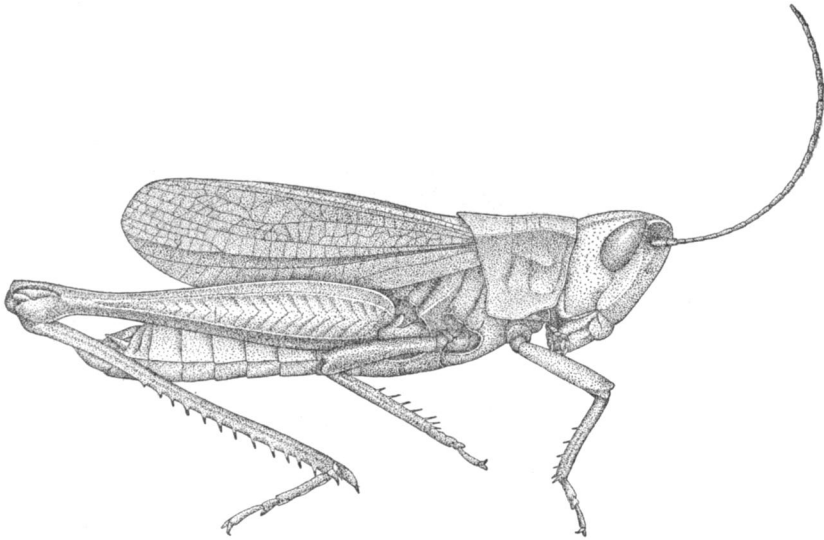


Fig. 3.—*Chloëaltis abdominalis* (Thomas). Manitou, Colorado. Lateral view of male. ( $\times 4$ .)

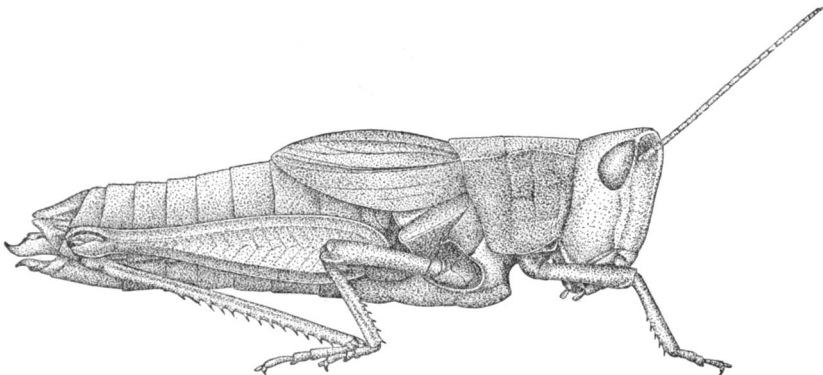


Fig. 4.—*Chloëaltis abdominalis* (Thomas). Mammoth Hot Springs, Yellowstone Park. Lateral view of female. ( $\times 3$ .)

males much resembles that of *C. conspersa*, but is not nearly so loud.

At Manitou, I found this species in about the same numbers among the scrub oaks and mountain-loving plants of a steep hillside. The

species appeared to be very local in habitat and, if a colony of the insect is not found, long search for the species would very probably be useless.

**STAURODERUS** Bolivar.<sup>7</sup>

**Stauroderus curtipennis** (Harris).

Muir, Bozeman Tunnel, Park-Gallatin Co., Montana, Aug. 12, 1 ♀. Sappington, Gallatin Co., Montana, Aug. 12, 1 ♂. Hill at head of Mammoth Hot Springs, Yellowstone Park, Aug. 5, 2 ♂, 1 ♀. Fountain, Lower Geyser Basin, Yellowstone Park, Aug. 6, 1 ♂. Near Grand Cañon, Yellowstone Park, 8,000 feet, Aug. 10, 2 ♂, 2 ♀. Yellowstone Lake, Aug. 8, 5 ♂, 4 ♀. Emerald Springs, Yellowstone Park, Aug. 7, 2 ♂, 2 ♀. Knob Hill, Colorado Springs, Aug. 17, 1 ♀. Manitou, Colorado, Aug. 16 and 23, 5 ♂, 5 ♀.

These specimens vary considerably in size and somewhat in structure, but such variation is paralleled in Eastern specimens, from which they cannot be separated.

This species was rather boreal in distribution and was found in numbers in tall marshy grass in a large open pasture on the shore of Yellowstone Lake. It was also found plentiful at Manitou, Colorado, in the same locality as *Chloëaltis abdominalis*. At Muir, Mammoth Hot Springs and Manitou the species was found in dry locations, all the other localities in which it was found being more or less damp. The stridulations of the males resemble sik-sik-sik-sik swiftly repeated, the sound being neither loud nor sharp.

**PLATYBOTHRUS** Scudder.

**Platybothrus brunneus** (Thomas).

Mammoth Hot Springs, Yellowstone Park, Aug. 5, 2 ♂. Summit of foothills near Mammoth Hot Springs, Aug. 5, 4 ♂, 4 ♀. Summit of foothill of Gallatin Range, Mammoth Hot Springs, Aug. 5, 1 ♂, 5 ♀.

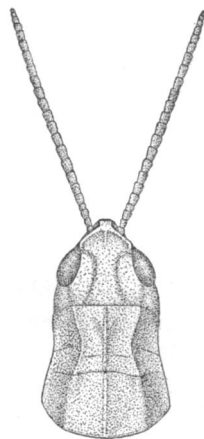


Fig. 5.—*Chloëaltis abdominalis* (Thomas). Mammoth Hot Springs, Yellowstone Park. Dorsal view of head and pronotum of female. (×3.)

<sup>7</sup> This generic name (*Catal. Sinopt. Ortópt. Fauna Ibérica*, pp. 46, 57, 1898) should be used in this connection in place of *Stenobothrus* if we recognize Bolivar's divisions as genera, as has been done by Burr (*Entom. Record and Journ. Variat.*, XVI, p. 320). If these groups are recognized as of only subgeneric rank, Fieber's *Chorthippus* must be used as the generic term in place of *Stenobothrus*, as has already been done in several previous papers by the senior author.

On geyser formation, Mammoth Hot Springs, Aug. 5, 1 ♀. Top of bare hill opposite Devil's Kitchen, Mammoth Hot Springs, Aug. 5, 1 ♀. Meadows near Norris Pass, Continental Divide, Yellowstone Park, Aug. 5, 1 ♀. Near Grand Canon, Yellowstone Park, Aug. 10, 2 ♂.

These specimens have the caudal tibiae with pale proximal annuli followed by dull glaucous and with the distal third reddish.

This species is distinctly boreal and apparently uncommon in collections, the only definite records being from Fort McLeod, southern Alberta, several localities in Idaho, Fort McKinney, Wyoming, and Estes Park, Colorado. Individuals from all except the Idaho localities have been examined.

The specimens taken were all found among the more boreal forms of vegetation in the Park. Nowhere was it possible to take a large series of specimens, in spite of the fact that when found individuals were easily captured. The insects move about quite hurriedly on the ground, and when disturbed can also use their wings advantageously.

#### **GOMPHOCERUS** Thunberg.

##### ***Gomphocerus clavatus*** Thomas.

Mammoth Hot Springs, Yellowstone Park, Aug. 5, 6 ♀. Summit of foothill of Gallatin Range, Mammoth Hot Springs, Aug. 5, 1 ♀. Manitou, Colorado, 6,800–7,000 feet, Aug. 23, 2 ♂, 5 ♀. Pike's Peak, 10,200 feet, Aug. 20, 1 ♀; Dark Cañon, 8,920–9,000 feet, Aug. 16, 8 ♂, 4 ♀; above Windy Point, 12,300 feet, Aug. 20, 16 ♂, 8 ♀, 6 nymphs; below Windy Point, 12,000 feet, Aug. 20, 6 ♂; along timber line, 11,578 feet, Aug. 20, 1 ♂; Mountain View, 9,700 feet, Aug. 20, 2 ♂, 5 ♀.

With this series of nearly seventy specimens, and twenty others in the collection of the Academy, we are unable to find any constant character or characters to separate the three so-called American species of this genus. We have attempted to apply the characters given by Bruner<sup>8</sup> to distinguish them, but the Windy Point series exhibits enough variation to prove the futility of attempting to recognize several species. The length of the antennae and the angulation of the fastigium vary to a great extent, and the inflation of the cephalic tibiae of the males apparently is as variable as in the European species of the genus.

I found this species by no means abundant about the Mammoth Hot Springs, but took it in both the highest and lowest locations. On

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<sup>8</sup> *Biol. Cent.-Amer.*, Orth., II, pp. 92, 93.

the hillside above Manitou, Colorado, I found the species in about the same numbers as at the Hot Springs. From Dark Cañon to the highest grassy locations on Pike's Peak, however, the species was common in all favorable locations. The insects were found most common in all open grassy spots, especially above the timber-line where short grasses grow everywhere between the scattered boulders. The males are very active and are constantly stridulating—sik-sik-sik-sik—a sound louder but similar to that produced by *Stauroderus curtispennis*. The females are slow and clumsy in their movements, appearing quite different from the males.

**PSOLOESSA** Scudder.

***Psoloessa maculipennis*** Scudder.

Knob Hill, Colorado Springs, Colorado, Aug. 17, 1 ♀.

This specimen is somewhat smaller than Kansas and New Mexican individuals of the species. The previous Colorado record of this species was simply "Southern Colorado."

While sweeping the prairie grass, a single specimen of this species was taken from among the hundreds of more common species. So great was the number of common Orthoptera in this locality that it was impossible to search for the scarcer individuals, but this species was not met with again even though much sweeping was done in the same vicinity.

**AGENEOTETTIX** McNeill.

***Ageneotettix deorum*** (Scudder).

Livingston, Park Co., Montana, Aug. 4, 1 ♂. Salt Lake City, Utah, Aug. 13-14, 9 ♂, 6 ♀. Grand Junction, Colorado, Aug. 15, 1 ♂. Antlers, Colorado, Aug. 15, 3 ♂, 1 ♀. Knob Hill, Colorado Springs, Colorado, Aug. 17-22, 73 ♂, 87 ♀. Austin Bluffs, Colorado Springs, Aug. 18, 2 ♀. Manitou, Colorado, Aug. 16, 3 ♂, 2 ♀. Garden of the Gods, Colorado, Aug. 17 and 19, 3 ♂, 3 ♀. Roggen, Weld Co., Colorado, Aug. 24, 1 ♀. Akron, Washington Co., Colorado, Aug. 24, 2 ♂.

With this extensive series before me, I am unable to separate Bruner's *scudderi* and *occidentalis*. The characters given by him in his key of the species of this genus<sup>9</sup> do not appear to be constant, as specimens from the type locality (Garden of the Gods) cannot be separated from others from the supposed range of *occidentalis* (Salt Lake City, Grand Junction and Antlers), while a sufficient series from any one locality

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<sup>9</sup> *Bull. 94, Colo. Agr. Exp. Sta.*, p. 58, 1904.

contains individuals with the characters supposed to be diagnostic of any of the three forms and numerous others which cannot be placed in one or the other of the three "species."

This was one of the most plentiful species encountered. It was found in many of the arid localities, but on the prairie it truly swarmed. Each sweep of the net would take a dozen or more specimens in this location, and so great were its numbers that other scarcer specimens, even when seen, would often easily escape in the myriads of this species.

**AULOCARA** Scudder.

**Aulocara ellioti** (Thomas).

Gray Cliff, Sweet Grass Co., Montana, Aug. 4, 2 ♂, 4 ♀. Livingston, Park Co., Montana, Aug. 4, 1 ♀. Electric, Park Co., Montana, Aug. 4, 1 ♀. Summit of foothills near Mammoth Hot Springs, Yellowstone Park, Aug. 5, 5 ♂, 6 ♀. Top of Ensign Peak, Salt Lake City, Utah, Aug. 13, 1 ♀. Knob Hill, Colorado Springs, Colorado, Aug. 17 and 22, 3 ♂. Prairie land, Colorado Springs, Aug. 18, 3 ♀. Garden of the Gods, Aug. 17, 19 and 23, 11 ♂, 4 ♀.

The largest series of this species was taken in a meadow of tall grasses and weeds at the western entrance of the Garden of the Gods. It was also taken on the prairie at Colorado Springs, in dry grass and sage at Gray Cliff and in the other localities in hilly sage-brush locations.

**Aulocara femoratum** Scudder.

Gray Cliff, Sweet Grass Co., Montana, Aug. 4, 1 ♂. Garden of the Gods, Colorado, Aug. 17, 19 and 23, 3 ♀.

As stated by Gillette<sup>10</sup> the females of this species are very similar to the same sex of *ellioti*, and rather difficult to distinguish. The slenderer caudal femora of *femoratum* are probably one of the best differential characters. The Montana record is the most northerly for the species.

The specimen taken in Montana was captured among the dried grasses in prairie land. Had I had more time in this locality I think more specimens could possibly have been taken. In the Garden of the Gods the species was scarce, the only individuals taken being captured in the grass near the western entrance.

**Aulocara parallelum** Scudder.

Hillside at Salt Lake City, Utah, Aug. 13, 2 ♂, 2 ♀. Top of Ensign Peak, Salt Lake City, Aug. 13, 1 ♂, 1 ♀. Antlers, Colorado, Aug. 15, 2 ♂.

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<sup>10</sup> Bull. 94, Colo. Agr. Exp. Sta., p. 30, 1904.



The color of the caudal tibiae, which were missing in the types, is similar to that of *A. elliotti*, with the pale proximal annuli more dis-

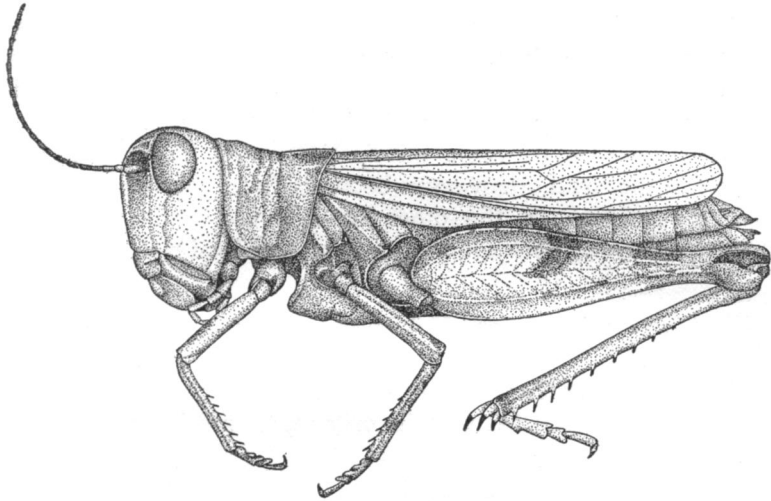


Fig. 6.—*Aulocara parallellum* Scudder. Salt Lake City, Utah. Lateral view of female. ( $\times 3$ .)

tinct in the females than in the males. The blackish postocular stripe mentioned by Scudder appears to be a variable character and is absent in some specimens and distinct in others.

The Antlers specimens are the first recorded outside of Salt Lake Valley.

This species was scarce in both localities in which it was taken. I found it on dry soil overgrown with sage, and owing to the activity of the individuals not many of even the few seen were taken. The caudal limbs of this species are so loosely attached that they snap off at the least strain and perfect specimens were consequently difficult to secure.

#### CEDIPODINÆ.

##### ARPHIA Stål.

*Arphia pseudonietana* (Thomas).

Upper Geyser Basin, Yellowstone Park, Aug. 7, 3 ♂, 1 ♀. Salt Lake City, Utah, Aug. 13, 1 ♂. Hillside at Salt Lake City, Aug. 14, 1 ♂, 1 ♀. Prairie

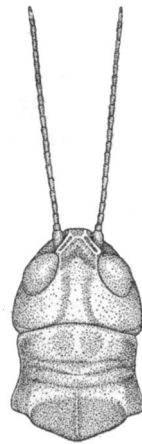


Fig. 7.—*Aulocara parallellum* Scudder. Salt Lake City, Utah. Dorsal view of head and pronotum of female. ( $\times 3$ .)

land, Colorado Springs, Colorado, Aug. 18, 1 ♂, 1 ♀. Akron, Colorado, Aug. 24, 1 ♂.

This series presents the variation in the intensity of the overlying blotches of dark brown usual in the species, and which in specimens of a light base color produces a strongly maculate type. The specimens from Upper Geyser Basin all have the sutural margin of the tegmina distinctly and broadly marked with pinkish ochraceous.

In the Upper Geyser Basin this species was to be found in small numbers in the small grassy spots between the geyser formations and the Firehole river. In the other localities the species was scarce. Its flight is very vigorous and accompanied by a loud clattering.

***Arphia arota* Scudder.**

Hill at head of Mammoth Hot Springs, Yellowstone Park, Aug. 5, 1 ♂.

This specimen has the wings orange red.

The individual collected was the only representative of the species seen.

**CHORTOPHAGA Saussure.**

***Chortophaga viridifasciata* (De Geer).**

St. Louis, Missouri, Aug. 27, 1 ♀.

**ENCOPTOLOPHUS Scudder.**

***Encoptolophus coloradensis* Bruner.**

Knob Hill, Colorado Springs, Colorado, Aug. 17, 1 ♂.

The recognition of this distinct species was quite a surprise. Its closest ally is *E. sordidus*, from which it is separated by numerous

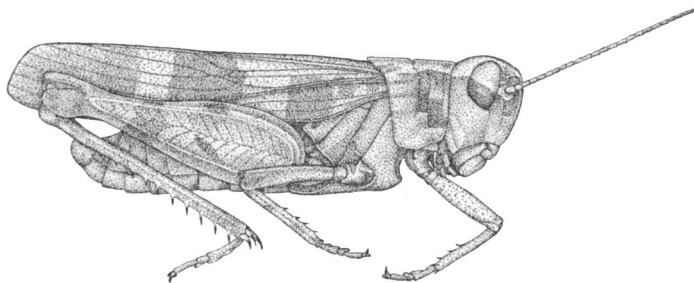


Fig. 8.—*Encoptolophus coloradensis* Bruner. Knob Hill, Colorado Springs, Colorado. Lateral view of male. ( $\times 3$ .)

characters. The only published record is the original description, the type being from Fort Collins, Colorado.

This specimen was beaten from the rank growth of weeds about a small water-filled depression in the prairie. Owing to the immense number of common species in this place no other specimens of this species was noticed, and much beating in the same locality failed to secure additional specimens.

**CAMNULA Stål.**

***Camnula pellucida* (Scudder).**

Waco, Montana, Aug. 4, 3 ♂, 2 ♀. Emigrant, Montana, Aug. 4, 1 ♀. Daileys, Montana, Aug. 4, 1 ♀. Sphinx, Montana, Aug. 4, 1 ♀. Electric, Montana, Aug. 4, 1 ♀. Muir, Bozeman Tunnel, Montana, Aug. 12, 1 ♂, 2 ♀. Sappington, Montana, Aug. 12, 1 ♂. Spire Rock, Montana, Aug. 12, 1 ♂. Mammoth Hot Springs, Yellowstone Park: hill at head of springs, Aug. 5, 1 ♀; on geyser formation at the upper end of springs, Aug. 5, 1 ♂. Fountain, Lower Geyser Basin, Yellowstone Park, Aug. 6, 1 ♂. Upper Geyser Basin, Yellowstone Park, Aug. 7, 1 ♂. The Thumb, Yellowstone Park, Aug. 7, 1 ♀. Near Grand Cañon, Yellowstone Park, Aug. 10, 1 ♀. Yellowstone Lake, Aug. 7, 1 ♀. Upper slope of Dark Cañon, Pike's Peak, Colorado, Aug. 16, 4 ♂, 1 ♀, 1 nymph.

The specimens from Waco are very interesting as they are exceedingly pale in color, some appearing rather uniform dull straw color with the maculations much reduced and quite feeble; others have the maculations distinct but the lighter shades all the same color as in the other pale individuals. The specimen from geyser formation at Mammoth Hot Springs is coated with the mineral deposit.

This species was one of the most plentiful of those found in Montana. At Waco the insects fairly swarmed in the dry prairie grass and sage. In this locality the specimens were extremely pale in coloration; exactly the color of the plants on which they were found. I have never seen greater swarms of insects than those of *C. pellucida* in the sage at the foot of the hills at Mammoth Hot Springs. The species was everywhere in Montana far more plentiful in the low dry locations, but in Colorado I found it only at a considerable elevation in Dark Cañon, Pike's Peak. One specimen was found in the Mammoth Hot Springs completely coated by the white formation. In another spring quite a few specimens of this and other species were found dead, killed probably by the fumes.



Fig. 9.—*Encopitophus coloradensis* Bruner. Knob Hill, Colorado Springs, Colorado. Dorsal view of head and pronotum of male. (×3.)

**HIPPISCUS** Saussure.**Hippiscus rugosus** (Scudder).

St. Louis, Missouri, Aug. 27, 1 ♀.

A single specimen of this species was seen and taken in a vacant city lot overgrown with weeds.

**Hippiscus conspicuus** Scudder.

Colorado Springs, Aug. 17, 1 ♀.

But one specimen of this species was seen.

**Hippiscus maculatus** Scudder.

Mammoth Hot Springs, Yellowstone Park: summit of neighboring foothills, Aug. 5, 1 ♀; summit of foothills of Gallatin Range, Aug. 5, 1 ♀.

A little doubt is attached to the identification of these specimens.

This species was scarce, but other specimens could have been taken had not the country been so hilly. Specimens would rise from the sage-brush hillside and fly some distance much more swiftly than one could follow.

**Hippiscus altivolus** Scudder.

Near Mountain View, Pike's Peak, Colorado, 10,100 feet, Aug. 20, 1 ♂.

This is apparently the first additional record of the species since the

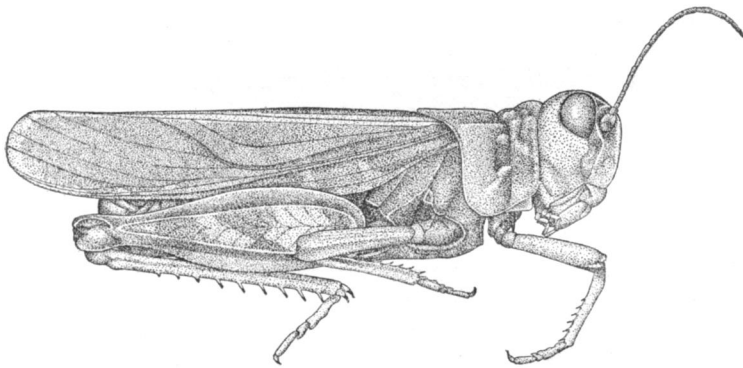


Fig. 10.—*Hippiscus altivolus* Scudder. Pike's Peak, Colorado. Lateral view of male. ( $\times 3$ .)

original description (Mt. Lincoln, Colorado, above timber, 11,000–13,000 feet above sea-level; Como, Colorado, 9,500 feet).

This specimen was found on the cog-wheel railroad track, in a spot where on each side almost the only vegetation was a dense thicket of aspen. The insect's flight was erratic and exceedingly swift.

**Hippiscus neglectus** (Thomas).

Mammoth Hot Springs, Yellowstone Park, Aug. 5, 3 ♀; summit of neighboring foothills, Aug. 5, 2 ♂, 4 ♀; summit of foothills of Gallatin Range, Aug. 5, 3 ♀; hill at head of springs, Aug. 5, 1 ♂; top of bare hill opposite Devil's Kitchen, Aug. 5, 1 ♂, 3 ♀. Upper Geyser Basin, Yellowstone Park, Aug. 7, 1 ♀. The Thumb, Yellowstone Park, Aug. 7, 1 ♂. Knob Hill, Colorado Springs, 7,000 feet, Aug. 17, 1 ♀.

This species varies considerably in size and greatly in the intensity of the color pattern and the sutural stripe. Individuals from Camas Prairie, Idaho, have been used for comparison.

About the Mammoth Hot Springs this species was the most plentiful of the larger Orthoptera. It preferred the hillsides to other locations, and, owing to its somewhat lighter form than other species of the genus found in that locality, it proved swift of flight and not always easy to capture. The single specimen taken at The Thumb was found in a small grassy space in the woods. Only one specimen was seen on the grassy prairie at Knob Hill, Colorado Springs.

**LEPRUS** Saussure.**Leprus interior** Bruner.

Salt Lake City, Utah, Aug. 13, 1 ♀. Hillside at Salt Lake City, Aug. 13 and 14, 4 ♂, 7 ♀.

These individuals agree well with a pair received from Prof. Bruner labelled Salt Lake City, and as a series are smaller and more conspicuously colored than a pair of *L. cyaneus* from Nephista, Colorado. The latter have the dark bars on the tegmina subobsolete, the light sutural stripes and a transverse median light bar being the only distinct markings. In the Salt Lake specimens the bars are distinct and rather regular, comparatively little variation being exhibited. Several of the latter specimens have the blue of the caudal tibiae weaker than in the other individuals.

This series was only taken after long and careful search. There was but one place on the steepest portion of Ensign Peak where the insect could be found, and although the females were easily captured when found, the males flew vigorously. So steep was the hillside that it was bare of everything but scattered grasses and an occasional sage-bush. When at rest the insects were wonderfully protected by their coloration.

**DISSOSTEIRA** Scudder.**Dissosteira carolina** (Linnaeus).

Billings, Yellowstone Co., Montana, Aug. 4, 1 ♂, 1 ♀. Salt Lake

City, Utah, Aug. 13 and 14, 2 ♀. Grand Junction, Colorado, Aug. 15, 1 ♂, 1 ♀. Colorado Springs, Colorado, Aug. 17, 3 ♂, 2 ♀. Knob Hill, Colorado Springs, Aug. 17-22, 6 ♂, 1 ♀. Fort Morgan, Morgan Co., Colorado, Aug. 24, 1 ♀.

Everywhere common in dusty locations.

***Dissosteira longipennis*** (Thomas).

Colorado Springs, Colorado, Aug. 17 and 18, 2 ♂, 1 ♀. Knob Hill, Colorado Springs, Aug. 17 and 18, 4 ♂, 1 ♀.

Specimens have also been examined from Denver, Pueblo, Fort Morgan and La Junta, Colorado, and Sidney, Nebraska.

A somewhat scarce species and one of the wariest insects collected. I found the specimens on the prairie, and would sometimes be obliged to follow one several hundred yards before an opportunity was offered to capture it. The flight of this insect is swift and high and often of considerable length.

***Dissosteira spureata*** Saussure.

Salt Lake City, Utah, Aug. 13 and 14, 13 ♂, 5 ♀.

This series exhibits a great amount of variation in the intensity of the color pattern, some individuals being very dull, almost uniform, while others have a strikingly contrasted pattern. As previously remarked by Saussure, this species bears a considerable superficial resemblance to *Spharagemon venustum*.

These specimens were all taken in a field of alfalfa stubble. Although in this locality the species was abundant, specimens were not taken with ease owing to their extreme wariness and their sudden zigzag flight. Their coloration was of great protective value, as when at rest it was almost impossible to distinguish them from the dried alfalfa.

**SPHARAGEMON** Seudder.

***Spharagemon æquale*** (Say).

Colorado Springs, Colorado, Aug. 17 and 18, 3 ♂, 3 ♀. Knob Hill, Colorado Springs, Aug. 18, 1 ♂, 1 ♀. Prairie land, Colorado Springs, Aug. 18, 1 ♂, 4 ♀. Salt Lake City, Utah, Aug. 13, 2 ♂, 3 ♀. Hill-side at Salt Lake City, Aug. 14, 1 ♀.

One specimen only is collared, a female from the prairie at Colorado Springs.

This species was moderately abundant on the grassy plain near Colorado Springs and was easily captured, as it was by no means as active as other species of the genus.

**Spharagemon bolli** Scudder.

Knob Hill, Colorado Springs, Colorado, 7,000 feet, Aug. 17, 2 ♂. Manitou, Colorado, 6,900–7,000 feet, Aug. 23, 5 ♂, 3 ♀.

These specimens are not separable from New Jersey specimens of the species.

Very few specimens of this species were found on the prairie, but it was quite common on a path leading through pine woods on the hills above Manitou.

**Spharagemon collare** (Scudder).

Billings, Yellowstone Co., Montana, Aug. 4, 1 ♂. Colorado Springs, Colorado, Aug. 17 and 18, 2 ♂, 4 ♀. Knob Hill, Colorado Springs, Aug. 17–22, 14 ♂, 37 ♀. Roggen, Weld Co., Colorado, Aug. 24, 1 ♂.

The specimen from Billings is assigned here with some doubt. One of the most plentiful of the large species found on the prairie.

**Spharagemon collare angustipenne** Morse.

Salt Lake City, Utah, Aug. 13, 2 ♀.

The two individuals recorded here were taken in the stubble field in which *Dissosteira spurcata* was abundant. This form appeared to be quite scarce.

**DEROTMEMA** Scudder.**Derotmema cupidineum** Scudder.

Whitehall, Jefferson Co., Montana, Aug. 12, 1 ♂. Grand Junction, Mesa Co., Colorado, Aug. 15, 4 ♂, 3 ♀. Antlers, Garfield Co., Colorado, Aug. 15, 9 ♂, 3 ♀.

These specimens are slightly larger than the original measurements given by Scudder, but otherwise fit the description quite well. The species appears to be readily separable from *D. haydeni* by the slightly longer and distinctly slenderer caudal femora. The pectinate character of the metazonal rugosities is not characteristic of *haydeni*, as each of the above series contains specimens in that respect not differing from *haydeni*, but the femora show them to be *cupidineum*. The Grand Junction specimens as a series are more suffused than the Antlers individuals.

The previous Colorado records of this species are from White river, near the Utah boundary, Montrose, Grand Junction and Palisades.

The specimens taken at Grand Junction were captured on the recently inundated silt along the bank of the Grand river where numerous specimens were seen. Those from Antlers were captured on the dry cactus and sage plain.

***Derotmema haydenii* (Thomas).**

Colorado Springs, Colorado, Aug. 17, 8 ♂, 7 ♀. Prairie land, Colorado Springs, Aug. 18, 3 ♂, 4 ♀, 1 immature individual. Knob Hill, Colorado Springs, Aug. 17-22, 8 ♂, 8 ♀. Garden of the Gods, Colorado, Aug. 17 and 23, 4 ♂, 3 ♀. Fort Morgan, Morgan Co., Colorado, Aug. 24, 1 ♂, 1 ♀.

Both red and yellow winged forms are represented in this series.

One of the common prairie species, which I often found in large numbers about damp depressions in the prairie and on the sandy borders of several shallow ponds.

**MESTOBREGMA** Scudder.<sup>11</sup>***Mestobregma plattei* (Thomas).**

Austin Bluffs, Colorado Springs, Colorado, Aug. 18, 2 ♀. Garden of the Gods, Colorado, Aug. 23, 1 ♀.

But three specimens of this species were seen, although much time was spent searching for additional specimens. The insects were found around stunted pines and bushes growing on cliff-like outcroppings in both localities. One specimen had just emerged. The flight of this species is low but swift.

***Mestobregma kiowa* (Thomas).**

Mammoth Hot Springs, Yellowstone Park, top of bare hill opposite Devil's Kitchen, Aug. 5, 1 ♀. Prairie land, Colorado Springs, Colorado, Aug. 18, 2 ♂, 3 ♀. Austin Bluffs, Colorado Springs, Aug. 18, 1 ♀. Knob Hill, Colorado Springs, Aug. 17-22, 41 ♂, 40 ♀. Manitou, Colorado, Aug. 16 and 23, 3 ♂. Garden of the Gods, Colorado, Aug. 17, 15 ♂, 11 ♀. Roggen, Weld Co., Colorado, Aug. 24, 1 ♀.

This large series exhibits the usual amount of variation in maculations seen in this species, chiefly in the intensity of those on the head and pronotum and in the line between the discoidal and anal areas of the tegmina. One female from Knob Hill has the anal area of the tegmina sub-roseate.

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<sup>11</sup> The authors cannot agree with Prof. Bruner's suppression of the genus *Mestobregma* (*Ent. News*, XVI, pp. 259-260) on the grounds that the insect on which it was erected was not *Ædipoda plattei* Thomas, as stated by Scudder, but one later described by Saussure as *Psinidia* (*Trachyrhachis*) *pardalina*. Granting this to be so, the action of the author, and not his intention, should alone be considered, and as *Mestobregma* was based on *Ædipoda plattei* Thomas, regardless of material in hand, it should rest on that specific name. The question of the application of the bird genus *Ixoreus* Bonaparte is a parallel case, for discussion of which see Sclater, *Ibis*, 1903, p. 142, the final ruling on which case by the American Ornithologists' Union Committee on Nomenclature (*vide Auk*, XXI, p. 424) being similar to the opinion expressed above.



An extremely abundant species wherever found, but swarming in certain grassland locations.

**Mestobregma thomasi** Caudell.

St. Louis, Missouri, Aug. 27, 3 ♂, 1 ♀.

These specimens are not separable from male individuals from Indiana received from Prof. Blatchley.

Found in a field overgrown with tall weeds in the city.

**METATOR** McNeill.

**Metator pardalinus** (Saussure).

Waco, Montana, Aug. 4, 1 ♂, 3 ♀. Knob Hill, Colorado Springs, Colorado, Aug. 17 and 22, 1 ♂, 2 ♀. Prairie land, Colorado Springs, Aug. 18, 6 ♂, 2 ♀.

Of the series here mentioned nine possess red or reddish wings, five yellow wings and one (Colorado Springs, prairie, Aug. 18, ♀) has the wings orange. The evidence of this material would thus support the view held by Caudell,<sup>12</sup> who regards *Psinidia maculosa* Saussure as merely the yellow winged form of *pardalinus*, an opinion entertained as possible by Saussure in the original description, his words being, 'Annæ præcedentis varietas?'

The Waco record is the most northern for true *pardalinus*, but if *maculosa* is identical the range is extended as far north as Fort McLeod, Alberta.

The specimens taken at Waco were captured among the sage-brush where the species appeared extremely plentiful. I also found this species plentiful at Colorado Springs, in the prairie wherever there was a damp depression. The insect is not swift of flight and may be easily taken with a net.

**CONOZOA** Saussure.

**Conozoa sulcifrons** (Seudder).

Grand Junction, Mesa Co., Colorado, Aug. 15, 11 ♂, 12 ♀.

Several specimens of this species were submitted to Mr. A. N. Caudell for comparison with material in the U. S. National Museum, and his remarks are quite interesting and worthy of record. In part he writes: "They are not *Conozoa wallula*; they are either *C. sulcifrons* or *behrensi* . . . I can scarcely tell these species apart. *Behrensi* is supposed to have shorter wings and elytra, have the median carina of the prozona more deeply cut and have the wing-bands wider. I have

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<sup>12</sup> *Proc. U. S. Nat. Mus.*, XXVI, p. 790.

typical specimens of it from California . . . these are quite distinct, but a good series before me grades into the *sulcifrons* form." Specimens of *behrensi* from San Diego and Claremont, California, appear readily separable from the Grand Junction individuals, but these are probably typical specimens.

This species has a rather wide distribution, having been recorded from Nogales and the Huachuca mountains, southern Arizona, in addition to the type locality and Grand Junction, Colorado. It would thus appear to be an Upper and Lower Sonoran species.

I took this species on the bare silt along the banks of the Grand river. In this locality it was plentiful and many specimens could easily have been taken as their flight is short and not vigorous. The coloration of the insects is undoubtedly of great protective value.

#### TRIMEROTROPIS Stål.

*Trimerotropis bilobata* n. sp.

Types: ♂ and ♀; Antlers, Mesa Co., Colorado, Aug. 15, 1904. Collected by Morgan Hebard. [Hebard Collection.]

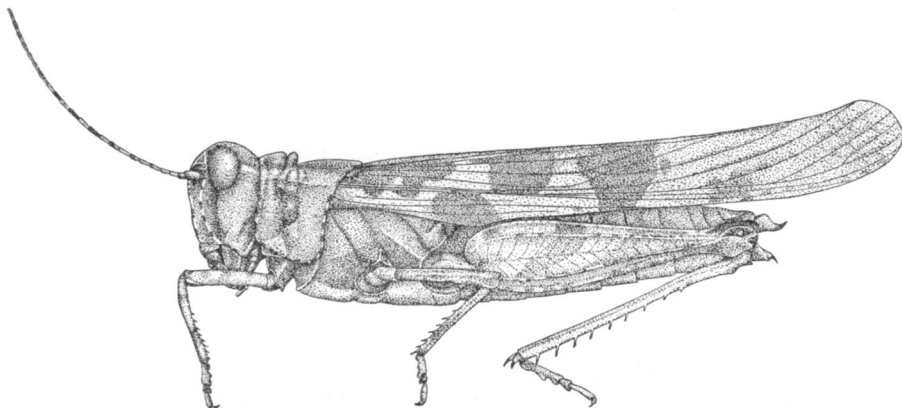


Fig. 11.—*Trimerotropis bilobata* n. sp. Antlers, Colorado. Lateral view of type. (× 3.)

This species is one of a number which might with almost equal propriety be placed in either *Conozoa* or *Trimerotropis*, but which we have placed here chiefly because McNeill has considered its allied species as a member of *Trimerotropis* rather than *Conozoa*.

The new form is apparently closely allied to *T. rebellis* (Saussure) and differs in the absence of a distinct projecting process on the ventro-caudal angle of the pronotum, in the apparently less distinct lateral

angles of the pronotum, the more distinct *Conozoa*-like tegminal bars and the color of the caudal femora.

The great elevation of the prozonal section of the median carina of the pronotum immediately separates it from most of the species. No close relationship exists to *Conozoa wallula* or any of the recently described species of that genus, the whole build being different from that seen in most of the forms of that genus, although *C. acuminata* approaches it very closely in this respect.

Size small; form compressed, slender and elongate; surface finely punctate. Head with the occiput considerably elevated, domed; vertex but slightly lower than the summit of the eyes; fastigium strongly declivent, rather broad in both sexes, greatest width very slightly more than the length, lateral margins distinct and very distinctly converging cephalad, passing into the carinae of the frontal costa without interruption, median carina of the fastigium precurrent, less distinct than the lateral margins of the same; frontal costa rather regularly but not strongly expanding ventrad, the margins subparallel for a short distance around the median ocellus, median sections distinct sulcate, less so dorsad, the marginal carinae reaching the clypeal margin; antennae slightly less than twice the length of the head and pronotum, slightly depressed; eye subovoid, moderately prominent particularly in the male, slightly greater than (male) or equal to (female) the length of the infra-ocular sulcus. Pronotum rather narrow; cephalic margin of the dorsum very obtuse-angulate, caudal

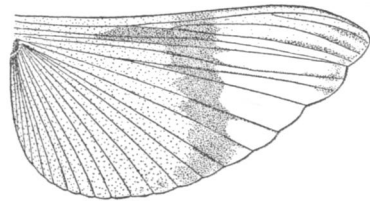


Fig. 12.—*Trimerotropis bilobata* n. sp.  
Wing. ( $\times 2$ .)

margin very slightly obtuse-angulate; median carinae cristate on the prozona and strongly divided into two lobes by the first sulcus, the incision being V-shaped and quite broad in the male and very narrow in the female, the cephalic lobe is subtrigonal in the male and lower and more longitudinally rounded in the female, second lobe equal to the first lobe in height and rounded dorsad in both sexes; carina of the metazona subcristate in both sexes; prozona about two-thirds the length of the metazona; lateral angles of the disk very distinct, and slightly carinate on the cephalic section of the metazona; lateral lobes slightly deeper than long, the ventro-caudal angle rounded with a very slight indication of a ventral blunt protuberance.

Tegmina elongate, narrow, subequal in width, the costal dilation

slight and rounded; apex slightly recurved dorsad, rounded obliquely truncate; intercalary vein distinct, about intermediate in position except dorsad where it regularly approaches and joins the median vein. Wings long and narrow, the width being contained twice in the length; costal margin evenly and very gently arcuate in the distal half; apex very narrowly rounded; axillary field arcuate apically. Caudal femora quite slender, gently tapering, the width contained about three and a half times in the length, pregenicular constriction not great, pagina rather flat, the sculpturing regular and quite distinct; caudal tibiæ with nine spines on the external margins.

General colors ecru drab overlaid with bistre in the male, the lighter color on the head and pronotum hoary white. Head with the facial and costal carinæ maculate with blackish brown, a large maculation beneath the base of each antenna and the ventral section of the eye marked with the same color in the male, the ventro-caudal section of the genæ being washed with the same tint and a postocular stripe indicated, while the fastigium is marked with pale cinnamon-rufous and a pair of arcuate diverging bars of the same color are present on occiput as well as a blackish interocular bar on the vertex; antennæ rather broadly annulate with the two general colors. Female with the head finely sprinkled with blackish spots with a trace of a light postocular bar. Pronotum of the male with a median bistre area which narrows caudad and the lateral lobes of prozona are strongly washed with bistre, forming a contrast with the hoary metazona. Pronotum of the female marked much as in the male, but the whole darker and without light colors, while the lateral angles of the disk and a distinct oblique bar on the lateral lobes of the prozona are darker than any of the other pronotal markings. Tegmina with two complete transverse bars, one median, one at the proximal fourth and an incomplete bar just distad of the median transverse one, which is broader mesad than at the costal and sutural margins, the bar at the basal fourth toward the sutural margin approaching the median bar and also extending proximad in the intercalary region; distal third with small irregular maculations which are chiefly along the veins. Wings with the transverse bar bistre and situated in the middle, quite narrow as the width is not quite a third and a little more than a fourth of the width of the wing, caudad the band arches very slightly proximad and only slightly suffuses the caudal margin, the stigma broad and heavy and extending about half way to the base; distal section hyaline with the longitudinal veins broadly suffused with bistre toward the apex; proximal half primrose yellow. Cephalic and median limbs

ecru drab distinctly annulate with bistre. Caudal femora ecru drab with three distinct very dark bars and a solidly colored genicular region, the bars being paler laterad than dorsad, the pregenicular annulus ochraceous buff; caudal tibiæ rather dull citron yellow touched with spots of fuscous and with the genicular sections bistre and the tips of the spines blackish.

*Measurements.*

	♂	♀
Length of body, . . . . .	17 mm.	24 mm.
Length of pronotum, . . . . .	3.5 "	4.5 "
Length of tegmen, . . . . .	18.2 "	26 "
Length of caudal femur, . . . . .	9.2 "	12.5 "

A series of one male and two female paratype specimens have been examined in addition to the types. The paratype male has the markings slightly more subdued than in the male type. One of the female specimens is marked as in the male type with strongly contrasted colors, except that the tegmina have the bars somewhat obsolete and the anal area with the veins more strongly lined with dark. The remaining female specimen is colored much the same as the type, except that the bars of the tegmina are slightly less conspicuous.

The female type is slightly larger than the paratype individuals of the same sex, while the additional male is slightly larger than the type.

This species was found in the arid valley of the Grand river near Antlers station, where the only vegetation was a heavy growth of low cactus interspersed with occasional sage. Specimens were by no means uncommon and could have been easily taken in numbers had the cactus not interfered so much with collecting, as when alarmed the individuals would invariably seek refuge in the dense beds of cactus. Orthoptera were not present in great numbers at this locality but the few species represented were quite interesting. The species *Æoloplus chenopodii* was the most abundant and most striking.

***Trimerotropis gracilis* (Thomas).**

Antlers, Garfield Co., Colorado, Aug. 15, 3 ♀.

This very distinct species has been recorded from localities ranging from central Idaho to Salt Lake Valley and Colorado. Thomas has recorded it also from the northern boundary (49th parallel) of Montana and Dakota, and Scudder includes Nebraska in its range. Caudell has definitely recorded this species from Durango, Colorado, and Gillette credits it to nineteen localities in the same State, the most eastern

of which are Greeley and Pueblo, the majority being west of the divide.

This species was found among the cactus and sage in the dry bottom lands of the Grand river valley. The insects were by no means plentiful and were also extremely shy.

***Trimerotropis cincta* (Thomas).**

Manitou, Colorado, 6,700–7,000 feet, Aug. 23, 11 ♂, 4 ♀.

The above series shows considerable variation in the strength of the median carina of the fastigium, some individuals having it strongly marked and in others it is hardly perceptible. The color of the caudal tibiae is quite variable in this species, as already noticed by McNeill, and the series in hand exhibits the following: ten with the distal three-fourths of the caudal tibiae greenish yellow, four with the same bluish green, and one red.

According to Gillette this species is found in the mountains and foothills of Colorado at altitudes ranging between 6,000 and 10,000 feet, and on both slopes of the divide. In his series of ninety-five specimens the hind tibiae were without exception bluish or yellowish on the distal portion. The species has been recorded from Nebraska, in addition to New Mexico and Colorado. The collection of the Academy contains specimens from Salida, Manitou Park and Fort Collins (Horse-tooth Mountain), Colorado.

This species was plentiful on a path among stunted pines on the upper slopes of the foothills back of Manitou. The location would have made it particularly difficult to capture specimens had not the individuals apparently trusted to their protective coloration. A close approach was necessary to cause them to take wing.

***Trimerotropis ferruginea* McNeill.**

Daileys, Park Co., Montana, Aug. 4, 1 ♂. Sphinx, Park Co., Montana, Aug. 4, 3 ♂, 2 ♀. Spire Rock, Montana, Aug. 12, 1 ♂ ("on bare mountain"). Upper Geyser Basin, Yellowstone Park, Aug. 7, 4 ♂.

The specimen from Spire Rock is assigned to this species with considerable doubt, as it is larger and has a rather different facies, but does not appear to be any closely allied form. The males from Upper Geyser Basin appear rather different from the Daileys and Sphinx specimens, being a little smaller and more like the Spire Rock individual in their somewhat more robust form, though considerably smaller size. This species is probably little more than a form of *bifasciata*, and hardly worthy of a name in view of the great amount of individual variation found in most of the species of the genus.

This species was found in rather bare mountainous sections and on the formation about the larger Yellowstone geysers.

***Trimerotropis monticola* Saussure.**

Mammoth Hot Springs, Yellowstone Park, Aug. 5, 1 ♀. Summit of foothills, Mammoth Hot Springs, Aug. 5, 1 ♂.

These specimens agree quite well with Nebraska, Colorado and Wyoming specimens in the collection of the Academy. The specimens examined present considerable variation in the length of the tegmina.

This appears to be the first record of the species north of Colorado, except Tie-Siding, Wyoming, from which locality Gillette has recorded it.

These specimens were taken in the more hilly portions about the Mammoth Hot Springs, where, on account of the character of the country, they were captured with difficulty. The individuals fly swiftly and for long distances when alarmed.

***Trimerotropis praelara* McNeill.**

Grand Junction, Mesa Co., Colorado, Aug. 15, 5 ♂, 1 ♀.

This species has the fuscous band of the wing very broad, slightly more than one-third the length of the same, and well continued around on the caudal margin, while the spur is almost absent, the disk very pale greenish yellow, and the apex hyaline except for the infuscation of some of the veins.

The light base color is almost bone white in some specimens, and distinctly washed with rufous in others.

This species is known only from Salt Lake, Utah, and Sidney, Nebraska, in addition to the locality here given.

Among the bushes growing in the silt deposit along the banks of the Grand river these specimens were secured. The species was by no means as plentiful as *T. montana*, which was found in the same locality.

***Trimerotropis laticincta* Saussure.**

Colorado Springs, Colorado, Aug. 17, 6 ♂, 5 ♀. Knob Hill, Colorado Springs, Aug. 18-22, 7 ♂, 4 ♀.

This series exhibits considerable variation in the intensity of the bands of the tegmina, and in the shade of the light basic color. In some the latter is decidedly reddish, in others pale yellowish, and in the majority dull ochraceous. The caudal tibiae are more orange in some specimens than in others, and the pronotum varies from dull ferruginous through warm browns to dull olive, and in one specimen dull blackish-brown.

As far as can be determined from the material in hand Scudder's

*T. latifasciata* from Utah is the same as this, and his name would have precedence. However, as no Utah material is available I prefer to use Saussure's name, provisionally at least, for specimens from eastern Colorado.

The evidence given by Cockerell<sup>13</sup> regarding the difference in color characters of individuals of this species taken in coitu is especially interesting in view of the value which has been attached to the characters there mentioned, *i.e.*, bands on the inner face of the caudal femora, and the width and curve of the wing band. Not much latitude is needed in these characters to connect forms like *laticincta* and *latifasciata* and *melanoptera*. Gillette does not consider *latifasciata* and *laticincta* separable from *T. citrina*.<sup>14</sup>

This species has been recorded from Fort Collins, Montrose, Grand Junction, Denver, Baileys and Golden, Colorado, by Caudell.

One of the more common of the larger prairie land species. The flight of this insect was less vigorous than is usual in species of the genus.

***Trimerotropis melanoptera* McNeill.**

Colorado Springs, Colorado, Aug. 18, 1 ♂. Knob Hill, Colorado Springs, Aug. 17 and 18, 2 ♂, 1 ♀. Prairie land, Colorado Springs, Aug. 18, 1 ♂.

Two of these specimens agree well in the color of the tegmina with a topotypic (Silver City) male, while three have the bars more prominent and contrasting with the lighter base color. The metazona of the pronotum is paler than the prozona in these three specimens, and in two of them the contrast is as great as in *T. monticola*. The black areas of the wings appear to be slightly less extensive than the specimens described by McNeill. The senior author's *T. snowi*<sup>15</sup> may prove to be but a form of this with a less extensive black area on the wings. From the material then in hand it appeared well worthy of separation, but the additional material shows variability which weakens its status.

This species was scarce even on the prairie land which appeared to be its favorite habitat. In habits it much resembled *T. laticincta*.

***Trimerotropis strenua* McNeill.**

Salt Lake City, Utah, Aug. 13 and 14, 4 ♂, 8 ♀.

This species is very close to *T. californica* Bruner, and probably

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<sup>13</sup> *Proc. Davenport Acad. Sci.* IX, p. 38.

<sup>14</sup> *Bull. 94, Colo. Agr. Exp. Sta.*, pp. 35-36.

<sup>15</sup> *Trans. Kansas Acad. Sci.*, XIX, p. 223.



should be considered nothing more than a race of it. The bars of the tegmina are usually somewhat narrower and the caudal tibiae not quite so deep in color. The majority of the specimens have a more or less distinct ferruginous or ochraceous wash suffusing the tegmina, while several have the lighter sections without the same, and clear bone white in color as in the pair of *californica* used for comparison. A pair of specimens from Salt Lake Valley, received from Prof. Bruner, and labelled by him *T. praeclara*, belong to this species. Some of the specimens examined have the tegminal bars more distinct and less broken into spots than others, while the width also varies as much as the intensity. A female individual of this species from Salt Lake City, in the collection of the Academy,<sup>16</sup> has the tegminal bars much broken into annuli.

In nine of the specimens examined a second median bar on the lateral face of the caudal femora is more or less distinctly indicated, while in six it is absent or represented only by a very faint clouding.

This beautiful species was quite common in the arid sage-brush region on the outskirts of Salt Lake City and the series was taken with ease. In spite of the insect's bold coloring it was most inconspicuous when at rest.

***Trimerotropis montana* McNeill.**

Grand Junction, Mesa Co., Colorado, Aug. 15, 10 ♂, 4 ♀.

This species, if such it might be called, is very closely allied to the preceding, as has been stated by McNeill.<sup>17</sup> As far as the material in hand goes it appears to be only a more subdued form, with the dark tegminal bars broader and pale areas more ochraceous and in a measure lacking the strong contrast seen in *strenua*. The character of the median carina of the fastigium and the proportions of the pronotum do not differ from the series of *strenua*, while the lateral face of the caudal femora in the greater majority have a median band more or less faintly indicated in addition to the constant subapical one.

This species has been previously recorded from Durango and Delta, Colorado, in addition to Grand Junction, as well as Boise City, Idaho, the type locality.

These insects were taken on the banks of the Grand river, on ground that had been recently inundated. The soil was sandy and clusters of tall bushes grew here and there. The specimens were active and not taken without difficulty.

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<sup>16</sup> *Trans. Amer. Ent. Soc.*, XXVII, p. 333.  
*Proc. U. S. Nat. Mus.*, XXIII, p. 433.

***Trimerotropis salina* McNeill.**

Colorado Springs, Colorado, Aug. 17, 1 ♂. Knob Hill, Colorado Springs, Aug. 17, 3 ♀.

These specimens are slightly larger than the measurements given by McNeill, but we have placed them here chiefly on account of the poorly contrasted tegminal bars and the broad wing band. The lateral face of the caudal femora presents a median bar of varying intensity in several specimens. The coloration (*i.e.*, blackish bars and suffusion) of the ventral sulcus of the caudal femora appears to be too variable to be given the prominence assigned to it by McNeill. The male individual here studied would be placed in another section of the *viniculata* group on the femoral coloration, while it unquestionably is the same as the three females which have the coloration as described by McNeill. Instances such as this are by no means confined to this species, but can be found in most any large series of a species of the genus.

***Trimerotropis fratercula* McNeill.**

Daileys, Park Co., Montana, Aug. 4, 13 ♂, 6 ♀. Sphinx, Park Co., Montana, Aug. 4, 1 ♀. Fountain, Lower Geyser Basin, Yellowstone Park, Aug. 6, 6 ♂, 6 ♀. Upper Geyser Basin, Yellowstone Park, Aug. 7, 3 ♂, 4 ♀. Mud Volcano, Yellowstone Park, Aug. 10, 1 ♂. Emerald Spring, Yellowstone Park, Aug. 7, 1 ♀. Yellowstone Lake, Yellowstone Park, Aug. 7 and 10, 1 ♂, 1 ♀.

This series is assigned to this species with some little doubt. Some affinity exists with *T. inconspicua* Bruner, at least as far as published diagnostic characters are concerned. The coloration of the ventral sulcus of the caudal femora varies in individuals from the same locality and not separable by any other character. Some present a solid blackish sulcus with a distinct light pregenicular annulus, others have a well-marked additional light median bar, and a number of specimens have the black interrupted on the sides of the sulcus but undivided in the middle. The evidence of this series of forty-three specimens of unquestionably but one species is that the coloration of the sulcus of the caudal femora is of little or no diagnostic importance. The coloration of the lateral and internal faces of the caudal femora are also unstable, in the authors' opinion, while the intensity of the tegminal bars and the width of the wing bars are by no means as stable as would be supposed from the importance given them as diagnostic characters.

The series studied presents some variation in size, the males from Fountain being somewhat larger than males from Daileys (length including tegmina: Fountain 28.5 mm., Daileys 25), while the Mud

Volcano and Upper Geyser Basin males are slightly smaller than the Daileys specimens (24 mm.). The females appear to be rather uniform in size. Three of the four females from Upper Geyser Basin are suffused with rufescent, while the other female and three males from the same locality are without any suffusion. The females from Fountain have the colors more contrasted than the majority of the Daileys females, while the Emerald Spring female has the contrast just as great. The males from Fountain have the pale tints more grayish and less ochraceous than in the Daileys males.

The species was so abundant about Daileys that during the brief stop of the train nineteen specimens were easily taken. This was also the most abundant species of Orthoptera found about the geyser formations of the Park. The insects are wary and rise on the wing with speed. The coloration of the individuals almost invariably blended exactly with the soil on which they were found.

***Trimerotropis vinoulata* Seudder.**

Electric, Park Co., Montana, Aug. 4, 1 ♂. Muir, Bozeman Tunnel, Montana, Aug. 12, 1 ♀. Whitehall, Jefferson Co., Montana, Aug. 12, 1 ♂, 3 ♀. Upper Geyser Basin, Yellowstone Park, Aug. 7, 1 ♀. Salt Lake City, Utah, Aug. 14, 1 ♀. Antlers, Garfield Co., Colorado, Aug. 15, 1 ♂. Debeque, Mesa Co., Colorado, Aug. 15, 1 ♂. Austin Bluffs, Colorado Springs, Colorado, Aug. 18, 2 ♀. Manitou, Colorado, 6,700–7,000 feet, Aug. 23, 4 ♂, 4 ♀. Garden of the Gods, Colorado, Aug. 19, 2 ♀.

This series represents a great and interesting amount of variation even for this plastic species. Variation in size is considerable, the largest males being from Electric, Debeque and Manitou, the smallest from Antlers; the largest female from Salt Lake City, the smallest from Austin Bluffs. These differences in size appear to be individual, as the smallest male (Antlers) is from the same general region as the largest (Debeque). The specimens from Muir and Whitehall, Montana, are large, of rather uniform size, and but little smaller than the large Salt Lake City individual.

In coloration we find such variation that a detailed account may be of interest. The Electric specimen has the bands solid and the lighter colors hoary and sharply contrasted; the Muir and Whitehall representatives are quite dull, the Muir specimen almost blackish, while the bands are only moderately distinct, in one of the Whitehall individuals broken up into annuli. The Muir and Whitehall type has the pronotum with little contrast, and the caudal femora less variegated than in the Electric individual. The Yellowstone specimen is overcast with

dull hoary, the bands very weak, narrow and broken into annuli, the whole insect being much duller and more inconspicuous than the usual type. The Salt Lake City female has the bands of about average width, but weak and rather broken. Antlers and Debeque specimens are of the type which might be called normal or typical, with the bands distinct, broad and solid, and the lateral lobes of the pronotum moderately variegated. Austin Bluffs specimens are overcast with reddish ochraceous, one with the bands more distinct and solid than the other; Manitou individuals overcast with dull red, the bands variable in intensity and solidity, but not in width, one specimen having the bands quite blackish. The Garden of the Gods specimens are particularly interesting, being entirely washed with brick red, the tegminal bands distinct but narrower than usual.

The Garden of the Gods specimens are very interesting as the suffusing tint is the predominating color of that region, and in line with this one would expect a uniform very pale type from strongly alkaline regions, which does not hold true of the large amount of material of this species seen. Series from San Diego, California, one of the original localities; Alamogordo, New Mexico, and Quartzsite, Arizona, are extremely variable among themselves, and each exhibit extremes as different, or nearly so, as those in the material here treated. However, no specimens quite as reddish as the Garden of the Gods individual have been seen from other localities. The band of the wing is quite narrow and weak in some of the Manitou specimens,<sup>18</sup> and heavy in Whitehall and Muir individuals.

The species was generally distributed and equally abundant in the localities in which it was collected. The specimens taken about the Garden of the Gods showed remarkable protective coloration, as all were overcast with brick red which blended exactly with the characteristic brick red formation of the Garden. This was the only species found on these outcroppings.

***Trimerotropis coeruleipennis* Bruner.**

Salt Lake City, Utah, Aug. 13, 2 ♂, 1 ♀. Top of Ensign Peak, Salt Lake City, Utah, Aug. 13, 1 ♂, 2 ♀.

These specimens of this beautiful species have the tegminal bars uniform in pattern and varying but slightly in intensity, except in the female from Salt Lake City in which they are quite dark. The coloration of the ventral sulcus of the caudal femora varies from black with two light bars in the distal half to but one bar in the region, while in

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<sup>18</sup> These may possibly represent one of the other species of the *vinculata* group

several specimens the evanescent bar (proximal) is present but incomplete. The coloration of the caudal tibiae varies from the usual light tint to a dark glaucous blue. The size of the specimens is quite uniform.

This species has been recorded from Washington (Yakima), Oregon, (Umatilla), Idaho, Montana, Wyoming, Utah and Los Angeles, California.

This species was found in the same locations as *T. cyaneipennis*, which species it much resembled in habits.

***Trimerotropis cyaneipennis* Bruner.**

Salt Lake City, Utah, Aug. 13, 4 ♂, 4 ♀. Foothills, Salt Lake City, Utah, Aug. 14, 3 ♂, 2 ♀.

This series is quite uniform in size, while variation in coloration is chiefly due to the intensity of the broken tegminal bars, though one specimen from Salt Lake City is uniformly very pale with most of the markings almost obsolete.

This species has been recorded from the Salt Lake Valley region, and from Grand Cañon, Flagstaff and Prescott, Arizona. The two males recorded from Prescott are very considerably darker than any of the Salt Lake Valley specimens examined.

This species was somewhat common but inhabited the most inaccessible portions of Ensign Peak, and owing to the rapidity of its flight specimens were taken with no little trouble.

***CIRCOTETTIX* Seudder.**

***Circotettix carlinianus* (Thomas).**

Mammoth Hot Springs, Yellowstone Park, Aug. 5, 1 ♀.

***Circotettix undulatus* (Thomas).**

Manitou, Colorado, 6,400 and 6,700 feet, Aug. 23, 1 ♂, 1 ♀. Pike's Peak, Mountain View, 9,700 feet, Aug. 20, 1 ♂, 1 ♀. Cripple Creek, Teller Co., Colorado, Aug. 19, 4 ♂.

These specimens have been compared with a series of twenty specimens from localities in the mountain regions of New Mexico, and one from Utah. Manitou individuals are more reddish than those from the other localities.

This species was nowhere abundant, but several specimens were found on the tailings about Cripple Creek mines.

***Circotettix rabula*<sup>19</sup> n. sp.**

Types: ♂ and ♀; summit of hill at head of springs, Mammoth Hot

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<sup>19</sup> *I.e., a jangling fellow.*

Springs, Yellowstone National Park, Wyoming; altitude 7,000 feet, Aug. 5, 1904. (M. Hebard.) [Hebard Collection.]

Allied to *C. undulatus* (Thomas) and *shastanus* Bruner, but differing from the former in the more robust form, the broader head, broader heavier and less strongly sulcate frontal costa, larger eyes, slightly less angulate caudal margin of the pronotum and in details of the coloration, as the lighter and usually more variegated tegmina and pronotum and the less distinct fuscous band and spur of the wing. From *shastanus* it appears to differ in the heavier form and the structure of the first subjacent radial vein.

The form of the wing of this species is essentially that of *C. undulatus*, and its closest relationship appears to be with that species. As *shastanus* is not available for study, comparison can only be made with descriptions, but the results of such comparisons seem sufficient to separate the specimens in hand, especially when we consider the peculiar structure of the first subjacent radial in the older species, while in the new one here treated the structure of that region does not differ materially from the type seen in *undulatus*.

In coloration a number of specimens of this species bear a striking superficial resemblance to *C. carlinianus*.

Size medium; form quite robust; surface finely rugulose. Head with the occiput gently but distinctly arched, the interocular region no more elevated than the summits of the eyes and in width but little less than the length of the eye; fastigium slightly declivent, forming an obtuse angle with the face, nearly as wide as long, shallow, with the median carina rather faint and the marginal carinae but little more distinct; frontal costa broad, expanded between the antennae and moderately constricted immediately ventrad of the ocellus, margins carinate and nearly (♂) or not (♀) reaching the clypeal margin, broadly sulcate ventrad of the ocellus particularly in the male, strongly punctate dorsad with a depressed area at the junction with the fastigium; eyes moderately prominent, rather small, very broad ovoid in shape; antennae slightly longer than the head and pronotum together, somewhat depressed in the proximal section. Pronotum deplanate dorsad, broad, distinctly expanded caudad; cephalic margin very broadly and obtusely angulate; caudal margin rectangulate in the male, obtuse-angulate in the female, the angle finely formed and little rounded in either sex; lateral angles rounded and hardly marked on the prozona, distinct and heavy shoulders present on the metazona; median carina fine, little elevated, depressed at the principal sulcus, prozona about half the length of the metazona; lateral lobes slightly

deeper than long, considerably impressed mesad, ventro-caudal angle rounded. Tegmina rather broad, the greatest width contained slightly more than four times in the length; costal lobe very slight and low, sutural margin straight, apex obliquely truncate toward the sutural margin, the distal third of the costal margin arcuate, making the immediate apex rounded rectangulate; intercalary vein distinct, intermediate in position proximad, close to the median vein distad. Wings moderately falcate, broad, the breadth being contained about once and a half in the length; humeral field with the apex rounded acute-angulate; axillary field with the margin very slightly arcuate and not lobate, being no more prominent than the next area in the radiate field; posterior axillary vein with its ramus paralleling closely the anterior axillary vein for a considerable distance, but not coalescing with it; radiate veins moderately thickened. Caudal femora rather slender, the ventral carina distinctly but slightly produced arcuate; caudal tibiae with nine spines on the lateral margins.

General color ecru drab, sprinkled, spotted and blotched with drab; eyes burnt umber; antennae of the paler color annulate with bistre; dorsum of the pronotum and the lateral lobes marked with the darker color. Tegmina with traces of three bands of quadrate and ocellate spots, these spots being almost wholly formed by the infuscation veins and cross veins, the bands being proximad, proximo-mesad and disto-mesad, while the distal third is supplied with scattered quadrate ocelli of the darker color. Wings with the transverse band very weak and almost severed, being chiefly an infuscation of veins and without definite limits, extending caudo-mesad and with a broad, moderately distinct stigma which extends half way to the base, the color of the band and stigma being drab; distal portion hyaline except for infusate veins, proximal portion citron yellow. Cephalic and median limbs of the general colors annulate; caudal femora with a pale pregenicular annulus, and with traces of two transverse bars which are more distinct dorsad; caudal tibiae pale, infusate proximad and distad, the spines touched apically with blackish.

*Measurements.*

	♂	♀
Length of body, . . . . .	27.5 mm.	29.7 mm.
Length of pronotum, . . . . .	6.4 "	6 "
Length of tegmen, . . . . .	29.5 "	28.7 "
Length of caudal femur, . . . . .	13 "	13.2 "

A series of ten specimens in the Hebard Collection have been examined in addition to the types: five, two males and three females,

from the type locality and date but taken on geyser formation at the upper end of the springs, one male from the immediate vicinity of the Hot Springs, August 5, another male from the summit of the first foothill of the Gallatin Range at the type locality, August 5, and one

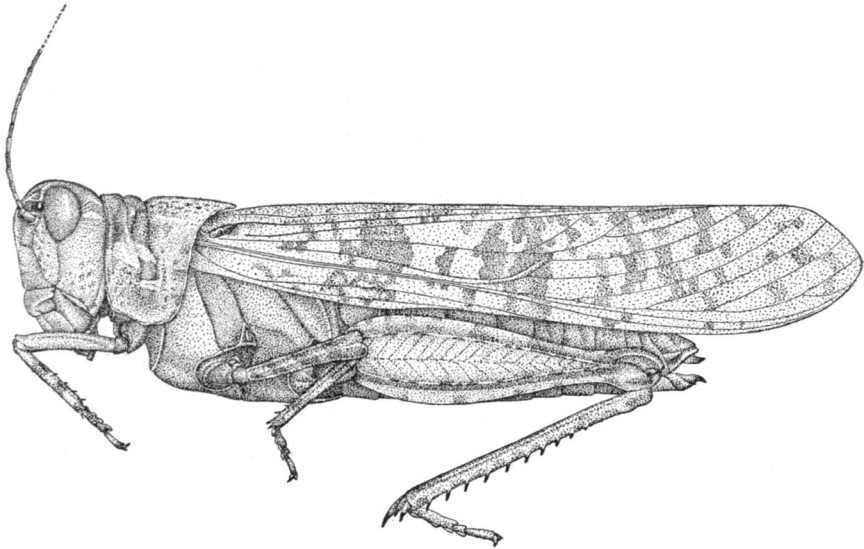


Fig. 13.—*Circotettix rabula* n. sp. Mammoth Hot Springs, Yellowstone Park. Lateral view of female type. ( $\times 3$ .)

female from Spire Rock, Montana, August 12. These specimens vary slightly in the strength of the tegminal bars, which are partially solid in some specimens, but all other characters appear to agree well with the types.

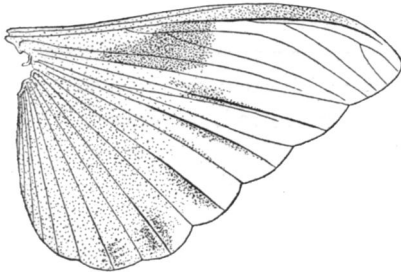


Fig. 14.—*Circotettix rabula* n. sp. Wing. ( $\times 2$ .)

Two males and two females received from Prof. Gillette and labelled *C. verruculatus* are referable to this new form. They are from Dutch George's and Virginia Dale, Larimer Co., Colorado.

This species was by no means plentiful about the Hot Springs and much time was occupied in collecting the ten specimens. The insects are most swift and shy, so that great difficulty was experienced in



approaching them close enough to strike with the net. They may be heard high in the air making for several minutes at a time a noise like the whirring of machinery. The sound is continuous while the insects rise and fall in a most peculiar erratic flight. I have seen specimens of this species fly for over a quarter of a mile making continually this peculiar sound. Of all the Orthoptera met with this was without doubt the most vigorous and elusive species.

***Circotettix suffusus*** (Scudder).

Summit of foothill of Gallatin Range, Mammoth Hot Springs, Yellowstone Park, Aug. 5, 1 ♀. Hill at head of springs, Mammoth Hot Springs, Aug. 5, 1 ♂. Upper Geyser Basin, Yellowstone Park, Aug. 5, 6 ♂, 2 ♀, 1 nymph.

These specimens are rather uniform in color for representatives of this genus, one being more clear grayish than the others, and several with a faint suggestion of ferruginous in their general tone.

About the Hot Springs this species was found in the open sagebrush of the hillsides, while at the Upper Geyser basin it was found in the small grassy openings in the dense pine woods.

***Circotettix verruculatus*** (Kirby).<sup>20</sup>

Muir, Bozeman Tunnel, Gallatin-Park Co., Montana, Aug. 12, 1 ♂, 1 ♀.

These specimens do not differ in size, the female, however, being slightly more robust. The frontal costa in the male is quite broad and similar to the female, thus differing from a large number of Eastern specimens examined. A series of thirty-one specimens, covering localities extending from the mountain regions of Pennsylvania and Maine west to the northern peninsula of Michigan (Pequaming), shows that while considerable variation in color and size is present in a series, it cannot well be correlated with locality. The two Montana specimens are among the largest seen.

These two specimens were taken on a cinder pile beside the railroad. Their crackling was very noticeable whenever they took flight.

**HADROTETTIX** Scudder.

***Hadrotettix trifasciatus*** (Say).

Sappington, Gallatin Co., Montana, Aug. 12, 1 ♂. Colorado Springs,

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<sup>20</sup> The type of this species was taken in "Latitude 57° N.," and in all probability was collected by Drummond, who traversed the Athabasca and Peace river region in this latitude in western Athabasca and northeastern British Columbia. If collected by Richardson, the other naturalist of the Franklin expedition, it was no doubt taken either in the vicinity of York Factory, Keewatin or on the Athabasca river south of Lake Athabasca.

Colorado, Aug. 17, 2 ♂. Knob Hill, Colorado Springs, Aug. 17 and 18, 4 ♂, 6 ♀. Prairie land, Colorado Springs, Aug. 18, 7 ♂, 10 ♀.

These specimens exhibit considerable variation in the intensity and width of the bands of the tegmina in the female, some having them very weak and broken up into spots, while a few have them as distinct as in the males. The males are quite uniform in the coloration of the tegmina, both in width of bars and intensity.

This species was quite common on the prairie. The flight is slow and specimens may be easily captured even without a net.

**BRACHYSTOLA** Scudder.

**Brachystola magna** (Girard).

Colorado Springs, Colorado, Aug. 18, 9 ♂, 4 ♀, 1 nymph. Knob Hill, Colorado Springs, Aug. 17, 5 ♂, 1 nymph. Prairie land, Colorado Springs, Aug. 18 and 19, 2 ♂, 6 ♀, 1 nymph.

This series of thirty specimens clearly shows that the species has two color phases and that the green phase should not be confused with Charpentier's *B. virescens*, a Mexican species of a quite distinct character, as an examination of his plate will show. Of the series examined eight are of the brown phase and twenty-one of the green, while one is too discolored to determine its true color. The green specimens vary considerably in the shade of the green, but the males appear to have the richer coloration.

There is considerable variation in the size of the males.

The following color description is made from a female specimen in the green phase from Colorado Springs received alive in Philadelphia and carefully stuffed after death, to-day presenting the same coloration as in life.

Predominating color oil green. Head dark oil green above becoming paler ventrad on the face and genæ, the caudal margin of the genæ, the mandibles and broad band extending from cephalad of the eye ventrad to the clypeal sulcus and the lateral portions of the clypeus pale flesh color; eyes clay color sprinkled with bistre; antennæ dusky, margined laterad in the proximal section with pale greenish. Pronotum with the lateral and median carinæ marked with very dark French green, on the metazona extending slightly ventrad and somewhat suffusing the lateral lobes; lateral carinæ bordered mesad by a line of pinkish vinaceous; recurved caudal and lateral lobe margins chiefly flesh color. Tegmina tawny ochraceous with fair-sized bistre spots well distributed over them. Abdomen suffused with bistre dorsad; a pair of rather broad distinct longitudinal lines, one on each side of the median carina, and a transverse series of spots on the caudal

margin of each segment, vinaceous. Venter bone white. Cephalic and median limbs bone white washed with greenish. Caudal femora oil green dorsad, whitish ventrad, the ventro-lateral sulcus with quadrate touches of vinaceous-rufous, while the internal face is suffused with the same color, a median line of French green is present on the lateral face and one of brick red on the internal face, genicular region bluish green dorsad, with a proximal transverse blackish bar ventrad, the arches chestnut; caudal tibiæ lavender laterad, vinaceous internally, the genicular region bluish, the spines bone white tipped with black.

This species was by no means abundant, but in the prairie region specimens would every now and then be found. The insects were so awkward that they seemed to have almost no control over their movements. Their coloration, however, undoubtedly proves a great protection to them.

#### LOCUSTINÆ.

##### **PAROPOMALA** Scudder.

##### **Paropomala wyomingensis** (Thomas).

1871. *Mesops wyomingensis* Thomas, Proc. Acad. Nat. Sci. Phila., 1871, p. 152. [Along the east base of the Black Hills, in the vicinity of Cottonwood Creek, Fall River Co., South Dakota, or Converse Co., Wyoming.]

1890. *Mesops cylindricus* Bruner, Proc. U. S. Nat. Mus., XII, p. 48. [Valentine, Nebraska, along the north side of Keya Paha creek, also on the bluffs south of Chadron, Nebraska.]

Roggen, Weld Co., Colorado, Aug. 24, 6 ♂, 1 ♀.

As far as can be determined from the material in hand, including specimens determined by Bruner as both *wyomingensis* and *cylindricus*, and the literature bearing on the subject, no reason is apparent for separating the two above-mentioned forms. Bruner's *cylindricus* was based on the brown phase, while in addition to the coloration larger size was given as a differential character. This latter would appear to be purely an individual matter, as green specimens have been examined nearly as large as Bruner's measurements of that sex in *cylindricus*. All the Roggen males are in the brown phase, and the single female in the green.

Material has also been examined from Valentine and Haigler, Nebraska, and Denver and Greeley, Colorado.

These specimens were beaten from some very tall weeds near the railroad track, while the train was making a brief stop.

##### **SCHISTOCERCA** Stål.

##### **Schistocerca lineata** Scudder.

Brush, Morgan Co., Colorado, Aug. 24, 1904, 1 ♂.

This individual is much smaller than the males measured by Scudder. Gillette<sup>21</sup> has called attention to the variation in size in this species.

Beaten from thicket of weeds.

**HESPEROTETTIX** Scudder.

***Hesperotettix viridis*** (Thomas).

Knob Hill, Colorado Springs, Colorado, Aug. 18, 1 ♀. Prairie land, Colorado Springs, Aug. 18, 1 ♂, 2 ♀. Hill near cog-road station, Manitou, Colorado, Aug. 16, 2 ♀.

These specimens vary considerably in size, the Manitou females being larger than any of the others, and similar to two from Arizona and New Mexico, while seven specimens from five other Colorado localities are in size about equal to the Colorado Springs individuals. The coloration varies very little, and then only in the intensity of the blackish head and pronotal markings.

This species was found distributed over a considerable region, but was in no place common.

***Hesperotettix festivus*** Scudder.

Salt Lake City, Utah, Aug. 13 and 14, 10 ♂, 11 ♀. Hillside at Salt Lake City, Aug. 14, 1 ♂, 1 ♀. Top of Ensign Peak, Salt Lake City, Aug. 13, 2 ♂, 2 ♀.

This series as a whole has shorter wings than nine individuals from southern Arizona, and in consequence of this the specimens appear somewhat more robust. The variation in size in the females is considerable, the larger type greatly predominating, while the males vary appreciably. The coloration tends in some specimens toward brownish and in a few is distinctly brown. This is also true of a male Salt Lake City specimen<sup>22</sup> which has been in the Academy collection quite a time.

This species was by far the most plentiful of the genus *Hesperotettix* which I found, and individuals were quite common in the sage growing from the foot to the top of Ensign Peak. Individuals of the species were very active, but relied chiefly for protection on their jumping ability, which was very considerable.

***Hesperotettix gillettei*** Bruner.<sup>23</sup>

Newcastle, Garfield Co., Colorado, Aug. 15, 1 ♀.

This recently described species is only known from the Grand river drainage.

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<sup>21</sup> *Bull. 94, Colo. Agric. Exp. Sta.*, p. 38.

<sup>22</sup> July 24, 1898.

<sup>23</sup> *Hesperotettix Gillettei* Bruner, *Bull. 94, Colo. Agr. Exp. Sta.*, p. 61, 1904. [Rifle, Glenwood Springs, Delta and Grand Junction, Colorado.]

During a brief stop of the train at Newcastle, I succeeded in capturing a single specimen of this species in the dust beside the railroad track.

**Hesperotettix speciosus** (Scudder).

Akron, Washington Co., Colorado, Aug. 24, 1 ♂.

The median carina of the pronotum of this specimen is deep maroon purple, which depth of coloration is almost equalled in a male from Rocky Ford, Colorado.

The specimen was beaten from tall weeds.

**ÆOLOPLUS** Scudder.

**Æoloplus regalis** (Dodge).

Fort Morgan, Morgan Co., Colorado, Aug. 24, 1 ♂.

A single specimen was beaten from low bushy weeds growing densely about a water tank. Vigorous beating for several minutes failed to produce other specimens.

**Æoloplus chenopodii** (Bruner).

Antlers, Garfield Co., Colorado, Aug. 15, 11 ♂, 14 ♀.

This series varies considerably in the intensity of the coloration, some individuals being more ashy than others.

The specimens were easily taken in spite of the cactus, in which they invariably sought refuge, for their movements were slow and they could jump but a short distance. The species was abundant.

**BRADYNOTES** Scudder.

**Bradynotes obesa** (Thomas).

Summit of first foothill behind hotel, Mammoth Hot Springs, Yellowstone Park, Aug. 5, 1 ♀. Top of bare hill opposite Devil's Kitchen, Mammoth Hot Springs, Aug. 5, 1 ♂, 2 ♀.

Although much time was spent searching carefully for specimens of this species, two days' collecting resulted in but four specimens being found. All were taken on the gravelly tops of the foothills where vegetation was almost absent. Their color blended perfectly with the soil and they appeared to rely on this as a means of protection.

**PODISMA** Latreille.

**Podisma dodgei** (Thomas).

Pike's Peak, Colorado, at elevations of 9,700 (Mountain View) and 10,200 feet, Aug. 20, 2 ♂, 1 ♀.

These specimens and the specimen of *Hippiscus altivolus* were the only Orthoptera seen in the rather barren tract of stunted aspen

above the railroad pumping station. This species seemed to be strictly terrestrial in habitat.

**Podisma oreas**<sup>24</sup> n. sp.

Types: ♂ and ♀; summit of foothill of Gallatin Range, Mammoth Hot Springs, Yellowstone National Park, Wyoming. Altitude, 7,000 feet. Aug. 5, 1904. [Coll. Morgan Hebard.]

Closely allied to *P. ascensor* Scudder from American Fork Cañon, Utah, agreeing almost perfectly in the form of the abdominal appendages and other characters, but differing in the vertex being somewhat elevated, the interspace between the eyes in the male over twice as broad as the first antennal joint, the frontal costa more sulcate, the size slightly larger, the antennæ reddish and the caudal tibiæ differently colored.

Size medium (for the genus). Head with the occiput rounded and distinctly elevated above the pronotum in the ♂, hardly elevated in the ♀; fastigium moderately declivent, very shallowly and broadly excavated, interspace between the eyes in both sexes over twice as wide as the proximal joint of the antennæ; frontal costa broad, hardly (♂) or very slightly (♀) narrower than the interspace between the eyes, slightly depressed around the ocellus, not sulcate, biseriate punctate dorsad; antennæ rather short, defective in the ♂, distinctly but not considerably longer than the pronotum in the ♀; eyes hardly prominent, truncate cephalad, distinctly longer than the infraocular sulcus. Pronotum very slightly inflated, very slightly tectate, metazona finely punctate; cephalic margin subtruncate, caudal margin very slightly arcuate, no distinct lateral carinæ but shoulder angles moderately prominent caudad; prozona slightly longer than the metazona in both sexes, quadrate in the ♂, slightly transverse in the ♀, principal transverse sulcus very well marked, median carina more distinct on the metazona than cephalad, but not markedly elevated anywhere in its length; lateral lobes distinctly longer than broad. Tegmina slightly less than the pronotum in length, sublanceolate, twice as long as broad in the ♂, half again as long as broad in the ♀, apex narrowly rounded, tegmina well separated dorsad. Abdomen with the apex but little elevated and not at all recurved; furcula about a third the length of the supra-anal plate and distinctly longer than the segment from which they spring, simple, parallel; supra-anal plate produced trigonal, considerably inflated mesad, median sulcation and bordering ridges distinct on the proximal half, the sulcation obsolete distad;

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<sup>24</sup> *Ὀρεας*, in allusion to its habitat.

cerci slender, strongly tapering in the proximal half, very slightly tapering in the distal half, apex blunt and very slightly excavated and falling considerably short of the apex of the supra-anal plate; sub-

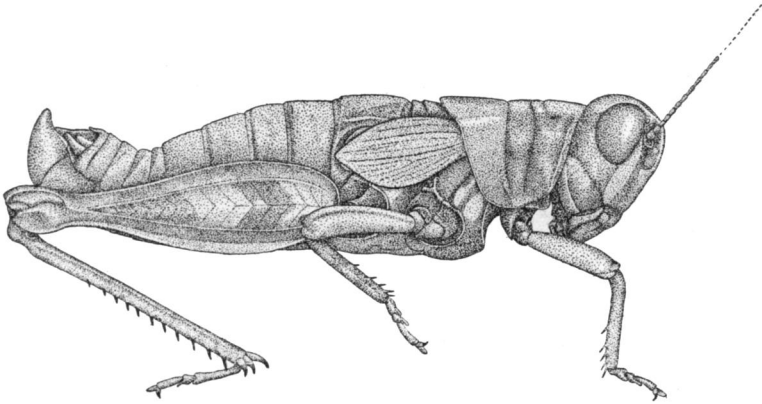


Fig. 15.—*Podisma oreas* n. sp. Mammoth Hot Springs, Yellowstone Park. Lateral view of male type. ( $\times 4$ .)

genital plate with the apical margin slightly elevated, the whole plate evenly tapering to this section, which is narrowly subtruncate and with a slight depressed area immediately caudad of the margin. Prosternal spine erect, slightly retrorse, thick and rather blunt. Interspace between the mesosternal lobes distinctly broader than long in the  $\sigma$ , over half again as broad as long in the  $\phi$ ; metasternal lobes sub-attingent in the  $\sigma$ , separated by a subquadrate interspace in the  $\phi$ . Median and cephalic limbs no more inflated in the  $\sigma$  than in the  $\phi$ . Caudal limbs moderately robust, femora reaching to the apex of the abdomen; caudal tibiae with eleven spines on each margin.

General color bistre in the  $\sigma$ , burnt umber in the  $\phi$ . Postocular streak rather faint and weak, seal brown in color; antennae carmine, rather dull distad. Tegmina in the  $\sigma$  darker ventrad than dorsad, unicolorous in the  $\phi$ . Stripes on the pleura distinct. Caudal femora with indications of two dark bars, chevron-shaped on the faces, the light color being an ecru drab, genicular arches and proximal section of the lobes on the internal face blackish, ventral face canary yellow, duller in the male than in the female; caudal tibiae very dull olive green in the  $\sigma$  and ochraceous in the  $\phi$ , except the dorsal face which is gamboge yellow in both sexes; spines black.



Fig. 16.—*Podisma oreas* n. sp. Dorsal view of apex of male abdomen. ( $\times 4$ .)

*Measurements.*

	♂	♀
Length of body, . . . . .	20 mm.	23 mm.
Length of pronotum, . . . . .	4.8 "	5.5 "
Length of tegmen, . . . . .	4 "	5 "
Length of caudal femur, . . . . .	10.5 "	12 "

The type specimens are unique.

These two specimens were taken on the pebbly summit of the foothills back of the Mammoth Hot Springs Hotel. The ground in this region was quite bare, but few plants being noticed.

***Podisma oregonensis*** (Thomas).

The following localities are represented, all in Yellowstone Park:

Mammoth Hot Springs, Aug. 5, 4 ♂, 1 ♀. Summit of first foothill of Gallatin range, Mammoth Hot Springs, Aug. 5, 4 ♂, 8 ♀. Continental Divide near 8,300 feet elevation (alpine meadow), Aug. 7, 1 ♂. Apollinaris Spring, Aug. 6, 1 ♀. Yellowstone Lake, Aug. 7, 8 ♂, 7 ♀. Near Grand Cañon, Aug. 10, 10 ♂, 4 ♀.

The specimens from the higher altitudes, as the Continental Divide and Grand Cañon representatives, average smaller than the individuals from lower altitudes. One male from Mammoth Hot Springs is partially covered with geyser deposit and is larger than any representative of the same sex (♂) seen. In coloration some specimens have the paler markings more brilliant than in others, and some few individuals from Grand Cañon are suffused with smoky brown.

This species appeared to be widely distributed and was found quite plentiful in the short grass of all the elevated open lands in the Park. The species was strictly terrestrial, and individuals were invariably active and possessed of considerable saltatorial power.

**MELANOPLUS** Stål.***Melanoplus lakinus*** (Seudder).

Knob Hill, Colorado Springs, Colorado, Aug. 17 to 22, 6 ♂, 4 ♀. Prairie land, Colorado Springs, Aug. 18, 1 ♂, 1 ♀. Fort Morgan, Colorado, Aug. 24, 11 ♂, 8 ♀. Akron, Colorado, Aug. 24, 2 ♂.

Several of the above specimens belong to the richly colored green phase described by Gillette.

In all the localities in which I collected on the Colorado prairie where the vegetation was high and rank, I found this beautiful species in moderate numbers. The individuals were very active, but could be easily beaten from the weeds in which they had taken refuge. The green form was noticeable for its brilliancy.

***Melanoplus occidentalis*** (Thomas).

Emigrant, Montana, Aug. 4, 1 ♂, 2 ♀. Knob Hill, Colorado



Springs, Colorado, Aug. 17 to 22, 7 ♂, 11 ♀. Austin Bluffs, Colorado Springs, Aug. 18, 1 ♀. Prairie land, Colorado Springs, Aug. 18, 4 ♂, 5 ♀. Garden of the Gods, Manitou, Colorado, Aug. 17, 2 ♂, 8 ♀. Pike's Peak, Colorado, Aug. 20, 1 ♂ at Mountain View, 9,700 feet, 1 ♀ at 10,100 feet, 1 ♀ at Middle Hudsonian, 10,500 feet.

The specimens here recorded from Emigrant, Montana, are, as far as known, the most northern definite record except one from Bismarck, North Dakota. The species has been recorded by Gillette from localities up to an altitude of 8,000 feet, and in view of the Pike's Peak records here given it will be seen to extend to an elevation of at least 10,500 feet, and to be truly an alpine species. In size these Pike's Peak individuals do not appear appreciably smaller than specimens from the vicinity of Colorado Springs, and are considerably larger than others from Durango, Colorado.

From the material collected this species appears to frequent a variety of habitats, from a distinctly arid region at Emigrant to a grassy gully in the Garden of the Gods. On the whole this form frequented the more sterile sections of the regions in which it was collected.

**Melanoplus flabellifer** Scudder.

Knob Hill, Colorado Springs, Colorado, Aug. 18, 2 ♂. Garden of the Gods, Manitou, Colorado, Aug. 17, 4 ♂.

These specimens are identical with Scudder's *flabellifer* in the form of the cerci, but the validity of the species is, in the authors' opinion, questionable. As Gillette has shown,<sup>25</sup> a large series of specimens will contain forms referable to true *occidentalis*, *flabellifer* and *cuneatus*, and have a number of intermediates between these types as well. A number of the specimens referred in this paper to *occidentalis* are not typical of it, but were placed there as it is the older species and has priority over *flabellifer* in case the latter is synonymized. This action appears to us to be inevitable, but the material at hand is not extensive enough to take such action. No specimens of the *cuneatus* type are in the series.

The specimens of this species were taken in the same localities as *M. occidentalis*.

**Melanoplus bowditchi** Scudder.

Grand Junction, Mesa Co., Colorado, Aug. 15, 3 ♂. Newcastle Garfield Co., Colorado, Aug. 16, 2 ♂.

These specimens are quite peculiar in appearance and not at all

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<sup>25</sup> Bull. 94, Colo. Agr. Exp. Sta., pp. 53-54.

similar in coloration to individuals from eastern Colorado and Nebraska. The coloration is decidedly brown, sometimes gray brownish, and little yellow or clear gray is apparent. The head and pronotum are sprinkled with fine umber dots and the tegmina have distinct quadrate maculations. The length of the body ranges from 17.5 to 19.5 millimeters.

All of the specimens of this species were found in the valley of the Grand river. Those taken at Grand Junction were found on silt near the river, where very little vegetation was to be seen. The insect's coloration was extremely protective and the species relied almost entirely on its wings for locomotory power.

**Melanoplus flavidus** Scudder.

Knob Hill, Colorado Springs, Colorado, Aug. 17-22, 21 ♂, 10 ♀. Prairie land, Colorado Springs, Aug. 18, 4 ♀. Garden of the Gods, Manitou, Colorado, Aug. 17 and 19, 1 ♂, 1 ♀.

This series shows considerable variation in size and color, the latter chiefly in varying intensity of the pattern.

This species was found in the same situations as *M. occidentalis*, but in much greater numbers.

**Melanoplus sanguineus** Bruner.

Garden of the Gods, Colorado, Aug. 17, 1 ♂, 1 ♀.

This striking and beautiful species was recently described from Lamar and Las Animas, in the prairie section of the Arkansas valley, Colorado. This record shows it ascends well into the foothills.

The coloration of the caudal femora and tibiae is very striking and serves to readily identify the species. The female specimen in hand has the head, caudal section of the disk of the pronotum and the dorsal face of the caudal femora somewhat suffused with greenish.

The specimens were taken in the high grass of a meadow at the western entrance to the Garden of the Gods.

**Melanoplus bruneri** Scudder.

Old Faithful Geyser, Upper Geyser Basin, Yellowstone Park, Aug. 7, 1 ♂.

This single specimen was taken in a small grassy field in the dense pine woods back of Old Faithful Inn.

**Melanoplus intermedius** Scudder.

Sphinx, Park Co., Montana, Aug. 4, 1 ♂. Sappington, Gallatin Co., Montana, Aug. 12, 1 ♂. Geyser formation, Mammoth Hot Springs, Yellowstone Park, Aug. 5, 1 ♂. Salt Lake City, Utah, Aug. 13, 6 ♂, 3 ♀. Top of Ensign Peak, Salt Lake City, Aug. 13, 5 ♂, 2 ♀. Newcastle, Garfield Co., Colorado, Aug. 16, 1 ♂.

The form of the cerci of the male individuals here placed under this species agree fairly well with Scudder's figure of those parts, and notwithstanding his remarks to the contrary the authors believe *intermedius* is at the most not more than a form of *atlanis*, and probably not even worthy of a name, varietal or otherwise. Numbers of specimens have been examined which seem to connect *atlanis* and *intermedius*, and all such are here treated under *atlanis*; only those closely approximating Scudder's figure being referred provisionally to *intermedius*.

Considerable variation in size is noticed, males ranging from 18 to 24 millimeters in the length of body. One male has the caudal tibiæ pale reddish, all the others varying shades of glaucous.

One of the typical sage-brush species. In some localities it was quite plentiful.

**Melanoplus atlanis** (Riley).

Livingston, Park Co., Montana, Aug. 4, 3 ♂, 4 ♀. Electric, Park Co., Montana, Aug. 4, 1 ♂. Jefferson Valley, Montana, Aug. 5, 1 ♀. Three Forks, Gallatin Co., Montana, Aug. 12, 1 ♂. Mammoth Hot Springs, Yellowstone Park, up to 7,050 feet, Aug. 5, 2 ♂, 2 ♀. Fountain, Lower Geyser Basin, Yellowstone Park, Aug. 6, 1 ♀. Pine woods, Old Faithful, Upper Geyser Basin, Yellowstone Park, Aug. 7, 4 ♂, 1 ♀. Salt Lake City, Utah, Aug. 13, 14 ♂, 12 ♀. Hillside, 4,700 feet, Salt Lake City, Utah, Aug. 14, 5 ♂ 1, ♀. Top of Ensign Peak, 4,900 feet, Salt Lake City, Aug. 13, 3 ♂. Five miles south of Salt Lake City, in alfalfa field, Aug. 13, 2 ♂, 3 ♀. Grand Junction, Mesa Co., Colorado, Aug. 15, 1 ♂, 2 ♀. Newcastle, Garfield Co., Colorado, Aug. 16, 1 ♂. Knob Hill, Colorado Springs, Colorado, Aug. 17 to 22, 7 ♂, 2 ♀. Prairie land, Colorado Springs, Aug. 18, 3 ♂, 2 ♀. Manitou, Colorado, Aug. 23, 9 ♂, 1 ♀; same locality at 6,700 feet, Aug. 16, 4 ♂, 1 ♀. Garden of the Gods, Colorado, Aug. 17, 5 ♂, 7 ♀. Dark Cañon, Pike's Peak, 8,920 feet, Aug. 16, 2 ♀. Roggen, Colorado, Aug. 24, 2 ♀.

This series exhibits a very great amount of variation in size and coloration, and in the form of the cerci many of the males placed here approach *intermedius*, as mentioned in the remarks under that form. The dullest specimens with little contrasted coloration are from the Garden of the Gods, and the palest ones are from the vicinity of Salt Lake City. However, while the majority of specimens of each series from the two above localities are uniformly dark or light, a few specimens from each locality are of what might be called the average type. Quite a number of specimens have the caudal tibiæ of various shades of glaucous.

A common species in both sage-brush and prairie-grass.

**Melanoplus bilituratus** (Walker).

Salt Lake City, Utah, Aug. 13, 1 ♂. Top of Ensign Peak, Salt Lake City, Aug. 13, 1 ♂.

These specimens are perfectly typical of *bilituratus*, which is probably only a race of *atlanis*. This is the first record of this species from Utah, and the first one east of Fort Halleck, Elko Co., Nevada, except one from Weeksville, Missoula Co., Montana.

These two specimens were both taken on hilly ground covered with sage.

**Melanoplus spretis** (Thomas).

Garden of the Gods, Colorado, Aug. 17, 2 ♀. Mountain View, Pike's Peak, Colorado, Aug. 20, 9,705 feet, 1 ♂.

The capture of these specimens is of considerable interest as it shows that this very destructive species is still present, either as a migrant or as a native, in regions formerly devastated by it. The absence of recent records of this species from Colorado shows it has become a scarce species. The material examined has been compared with individuals from Nebraska and North Dakota.

Two specimens from the Garden of the Gods were taken in a grassy meadow, while the other specimen was taken in an aspen thicket in sparse grass.

**Melanoplus defectus** Seudder.

Muir, Bozeman Tunnel, Park-Gallatin Co., Montana, Aug. 12, 2 ♂. Mammoth Hot Springs, Yellowstone Park, Aug. 5, 1 ♂. Summit of first foothill of Gallatin range, Mammoth Hot Springs, Aug. 5, 2 ♂, 3 ♀. Top of bare hill opposite Devil's Kitchen, Mammoth Hot Springs, Aug. 5, 1 ♂.

This species, previously known only from the type locality, Grand Junction, Colorado, and Nebraska, is quite distinct from the *atlanis-spretis* type, the form of the subgenital plate, which is considerably elongate, being at a glance sufficient to separate it.

**Melanoplus dawsoni** (Seudder).

Muir, Bozeman Tunnel, Gallatin-Park Co., Montana, Aug. 12, 2 ♂, 8 ♀. Knob Hill, Colorado Springs, Colorado, Aug. 22, 2 ♀. Manitou, Colorado, Aug. 23, 1 ♂, 7 ♀. Hillside near Manitou, Colorado, 6,700 feet, Aug. 16, 5 ♂, 7 ♀.

Material from Fort Collins, Colorado, has been examined in this connection. All the material studied belongs to the short-winged type of the species. Taken as a whole the series examined is quite uniform in size, and with such color variation as does exist being chiefly in the lighter or dark shade of the general color.

I found this species quite plentiful in a grassy field choked with many bushes. In this locality the species far outnumbered any other Orthopteron. At Manitou I found it on the hillside, where mountainous plants and scrub oaks formed practically the only vegetation.

**Melanoplus montanus** (Thomas).

Mammoth Hot Springs, Yellowstone Park, Aug. 5, 3 ♂, 6 ♀.  
Norris Pass, Continental Divide, Yellowstone Park, Aug. 7, 2 ♀.

This rather conspicuous species has previously been recorded only from Montana. The males in the series examined are quite uniform in size and fairly so in coloration. The females vary considerably in size, one from Mammoth Hot Springs being distinctly smaller than the others, which latter are slightly larger than the two females from Norris Pass. The dark colors are more blackish and the browns more rufescent in the Norris Pass individuals than in any others.

A distinctly mountainous species which I found only on the higher hillsides. The insects were powerful but too awkward to escape capture.

**Melanoplus altitudinum** (Seudder).

Pike's Peak, Colorado, Dark Cañon, 8,920 feet, Aug. 16, 16 ♂, 9 ♀, 1 nymph; upper slope of Dark Cañon, 9,000 feet, Aug. 16, 2 ♂, 2 ♀; below Windy Point, 12,000 feet, Aug. 20, 3 ♂, 2 ♀.

The Dark Cañon specimens are quite uniform in size, but the three Windy Point specimens are smaller than any of the former and the males are smaller than any specimens of the species seen. The smallest Dark Cañon male measures 16.2 millimeters in length, while a Windy Point specimen measures 14.5. There is considerable variation in the intensity of color in the series examined, but the pattern does not vary to any considerable degree. The proximal portions of the antennæ are more red than orange in all the Pike's Peak specimens. The ventral sulcus of the caudal femora is dull yellowish in some specimens and suffused with sanguineous in others.

This species was extremely common in grassy Dark Cañon, while several specimens were also taken in the short grass above the tree-line. The insects were active but easily captured.

**Melanoplus fasciatus** (Walker).

Pine woods, Old Faithful Geyser, Upper Geyser Basin, Yellowstone Park, Aug. 7, 3 ♂, 6 ♀. Knob Hill, Colorado Springs, Colorado, Aug. 17, 1 ♀. Manitou, Colorado, 6,900 feet, Aug. 23, 3 ♂, 2 ♀. Pike's Peak, Colorado: Mountain View, 9,700 feet, Aug. 20, 1 ♂; Dark Cañon, 8,920 feet, Aug. 16, 1 ♂; below Windy Point, 12,000 feet, Aug. 20, 1 ♀.

These specimens vary considerably in size, as is usual in this species, particularly in the females. No difference is noted between Pennsylvania and New Jersey specimens and those recorded above. All the individuals here studied have the tegmina falling short of the tips of the caudal femora.

The Windy Point record carries the vertical range of this species a thousand feet higher than previous records.

This was the only species to be found in the dense pine woods back of Old Faithful Geyser, and it was one of the very few distinctly sylvan species taken. One specimen, however, was captured above the timber-line on Pike's Peak and one on the prairie outside of Colorado Springs. The insects were extremely powerful and vigorous.

**Melanoplus femur-rubrum** (DeGeer).

Three Forks, Gallatin Co., Montana, Aug. 12, 2 ♂. Willow Creek, Gallatin Co., Montana, Aug. 12, 2 ♂. Sappington, Gallatin Co., Montana, Aug. 12, 3 ♂, 2 ♀. Mammoth Hot Springs, Yellowstone Park, Aug. 5, 4 ♂, 1 ♀. Geyser crust, Old Faithful, Upper Geyser Basin, Yellowstone Park, Aug. 7, 4 ♂, 1 ♀. Five miles south Salt Lake City, Utah, in alfalfa field, Aug. 13, 1 ♂. Grand Junction, Mesa Co., Colorado, Aug. 15, 1 ♂. Knob Hill, Colorado Springs, Colorado, Aug. 17-22, 39 ♂, 21 ♀. Manitou, Colorado, Aug. 22, 1 ♂, 5 ♀. Garden of the Gods, Colorado, Aug. 17, 1 ♂, 2 ♀. Dark Cañon, Pike's Peak, Colorado, 8,920 feet, Aug. 16, 1 ♂. Roggen, Weld Co., Colorado, Aug. 24, 4 ♂. Table Rock, Pawnee Co., Nebraska, Aug. 25, 1 ♂. Hannibal and Louisiana, Missouri, Aug. 25, 2 ♂. St. Louis, Missouri, Aug. 27, 4 ♂, 1 ♀.

The Colorado series contains individuals which are typical of *M. plumbeus* as understood by Scudder, but from this extremely bright type any number of intermediates, forming a complete chain and connecting the dull form of *femur-rubrum* found in the East, can be selected. From the Knob Hill series alone the extreme *plumbeus* type and typical *femur-rubrum* with seven graded intermediates can be selected. The majority of specimens belong to the intermediate forms, the extremes being scarcer, in the studied series, than the annectant forms.

The authors fully agree with Gillette's remarks<sup>26</sup> on this species and cannot consider *plumbeus* as other than brightly colored *femur-rubrum*. The specimens from Roggen, Colorado, Nebraska and Missouri do not approach *plumbeus*. The specimens from Montana localities are very

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<sup>26</sup> Bull. 94, Colo. Agr. Exp. Sta., pp. 48-50.

noticeably smaller than the others examined. No short-winged individuals have been seen.

This species was found in many localities, but nowhere more common than in the prairie grass outside of Colorado Springs. The brilliantly colored specimens (*M. plumbeus* Dodge) were always found in the damper locations where vegetation was most abundant.

***Melanoplus monticola* Scudder.**

Geyser crust, Old Faithful Geyser, Upper Geyser Basin, Yellowstone Park, Aug. 7, 1 ♀. Near Grand Cañon, Yellowstone Park, Aug. 10, 2 ♂, 3 ♀. Yellowstone Lake, Aug. 7, 7 ♂, 9 ♀. Knob Hill, Colorado Springs, Colorado, Aug. 22, 27 ♂, 17 ♀. Pike's Peak, Colorado, Aug. 20: Mountain View, 9,700 feet, 1 ♂, 1 ♀; Middle Hudsonian, 10,500 feet, 2 ♂; along timber-line, 11,578 feet, 3 ♂; below Windy Point, 12,000 feet, 13 ♂, 12 ♀.

This large series exhibits a considerable amount of variation in color and size, the greater part of which can be attributed to elevation. The specimens from Pike's Peak are all smaller, those from over 11,000 feet particularly, and the colors are as a rule duller. Specimens from Windy Point are as small as 15 (♂) and 16 (♀) millimeters in the length of the body, while those from Knob Hill are much larger and range between 17.5 and 22 (♂) and 23 and 30 (♀). One male and one female from Yellowstone Lake as well the majority of the Pike's Peak individuals are very dark in color, while some of the females from the latter locality are strongly touched with green. The specimens from the lower elevations are quite richly colored, and this with their larger size would seem to indicate another species, but no characters of the appendages seem to warrant their separation. The Middle Hudsonian individuals are perfectly intermediate between the Pike's Peak representatives and the lowland specimens in size and the brilliancy of the coloration.

The species has previously been recorded only from Sierra Blanca, Colorado, 12,000 to 13,000 feet, and from Windy Point, Pike's Peak.

This species was found in exceedingly varied locations. Not only was it abundant in the alpine herbage above the timber-line on Pike's Peak, but it was also plentiful on the prairie outside of Colorado Springs. In the Yellowstone Park the species was found in the decidedly boreal portions.

***Melanoplus canonicus* Scudder.**

Salt Lake City, Utah, Aug. 13, 9 ♂, 4 ♀. Hillside at Salt Lake City, Aug. 14, 2 ♀. Top of Ensign Peak, Salt Lake City, Aug. 13, 2 ♀. Grand Junction, Colorado, Aug. 15, 4 ♀.

These specimens agree fully with the description and figures of this species, which has been previously recorded only from northern and western Arizona. There is considerable variation in size, 20 to 24 millimeters in the length of body of the ♂ and 24 to 28.5 in the ♀. The color of the caudal tibiae varies from pale glaucous to very decided blue, pale laterad, while the general color is more besprinkled with fine spots of umber on the dorsum in some specimens than in others.

This species was found almost invariably among the sage. The color of the insects blends so exactly with the sage-brush that when at rest they are difficult to find. I noticed that the insects almost always sought refuge in the sage instead of on the ground. On and about Ensign Peak the species was plentiful.

**Melanoplus coccineipes** Scudder.

Knob Hill, Colorado Springs, Colorado, Aug. 17-22, 114 ♂, 77 ♀. Prairie land, Colorado Springs, Aug. 18, 3 ♂, 5 ♀. Manitou, Colorado, Aug. 22, 2 ♀. Garden of the Gods, Colorado, Aug. 17, 5 ♂, 2 ♀. Roggen, Colorado, Aug. 24, 7 ♂, 4 ♀.

This large series presents a considerable amount of variation in size and color. The smallest ♂ measures 17.5 millimeters in the length of body, the largest 22; the smallest ♀ 20, the largest 26. The individuals with the pronotum with a dark median bar superficially much resemble *M. packardii*. The general coloration is quite dark in some individuals and very light in others, the latter type having all the normal darker markings very weak, while some few specimens have the dorsum of the head and pronotum suffused with purplish red. The Roggen individuals are more grayish than any others examined. Of the large series examined all but two have red caudal tibiae, the color usually pale coral red. The other two specimens, a pair from Knob Hill, have glaucous tibiae. The authors are much inclined toward the opinion recently expressed by Gillette,<sup>27</sup> to the effect that *M. coccineipes* represents merely a red-legged form of *M. angustipennis*.

This was one of the species which made up the vast swarms of Orthoptera everywhere to be found in the prairie grasses outside of Colorado Springs. So great was the number of grasshoppers that it was almost impossible to follow any one interesting specimen when seen. All of the specimens of this species were taken by sweeping the grass.

**Melanoplus packardii** Scudder.

Emigrant, Park Co., Montana, Aug. 4, 1 ♂, 1 ♀. Mammoth Hot

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<sup>27</sup> Bull. 94, Colo. Agr. Exp. Sta., pp. 43, 46.



Springs, Yellowstone Park, Aug. 5, 1 ♀. Salt Lake City, Utah, Aug. 13, 2 ♂, 2 ♀. Top of Ensign Peak, Salt Lake City, Aug. 13, 1 ♂. Five miles south of Salt Lake City, in alfalfa field, Aug. 13, 1 ♂, 4 ♀. Knob Hill, Colorado Springs, Colorado, Aug. 17-22, 18 ♂, 25 ♀. Prairie land, Colorado Springs, Aug. 18, 3 ♀. Garden of the Gods, Colorado, Aug. 17 and 23, 1 ♂, 1 ♀. Fort Morgan, Colorado, Aug. 24, 1 ♀.

From the above series it is quite evident that representatives of this species from the general vicinity of Colorado Springs are smaller than specimens from Montana, Yellowstone Park, Utah and eastern Colorado. Males from Montana, Utah and the Yellowstone range between 27 and 30 millimeters in length of body, while Knob Hill males measure from 22.5 to 26. The single female from Fort Morgan, however, is as large as the average Utah female. Specimens examined from several Nebraska localities are about the same size as the Knob Hill individuals and smaller than the Fort Morgan representative.

In coloration the Montana, Utah and Yellowstone individuals are much more strikingly colored than those from Knob Hill, the colors being more contrasted and richer. In a series of six specimens from Boulder and Fort Collins, examined in this connection, several are brightly colored; one male, the only Boulder specimen, being as striking as Utah individuals.

In the series listed above seven specimens have wholly glaucous caudal tibiae, while the remainder vary from carmine to pale pinkish, including some solferino and very pale purplish tibiae, while one (Salt Lake City) has partially glaucous, partially solferino and purple tibiae, the glaucous pale and limited to the proximal portion of the lateral faces.

The specimens of this species taken at Salt Lake City were almost all from the luxuriant weeds growing along ditches and drains. Those from Colorado Springs were captured in the more heavily weed overgrown spots about damp depressions in the prairie. The insects were active, but often clung tenaciously to the weeds in which they hid, and it was consequently easy to capture as many as desired.

***Melanoplus conspersus* Scudder.**

Colorado Springs, Colorado, Aug. 18, 2 ♂, 1 ♀. Knob Hill, Colorado Springs, Aug. 17-22, 39 ♂, 18 ♀. Prairie land, Colorado Springs, Aug. 18, 2 ♀. Garden of the Gods, Colorado, Aug. 17-19, 13 ♂, 5 ♀. Akron, Washington Co., Colorado, Aug. 24, 1 ♀.

This species in the highly colored individuals is quite handsome and appears rather different from the duller specimens, which differ how-

ever, only in the replacing of the yellow lighter colors with shades of light brown. In some individuals the caudal tibiae are much more valgate than in others, while the inflation of the ventro-lateral carina and the adjacent parts of the caudal femora is quite marked in the male. A rather striking character of the coloration of this species is the continuation of the internal black vertical genicular bar of the caudal femora on the ventral surface, but not on the external face. A blackish patellar spot is present on the caudal tibiae of some specimens and not of others.

The specimens here studied have been compared with paratype material.

This species was one of those which swarmed in the prairie grass. In certain localities where the ground was somewhat damp it occurred in countless numbers.

***Melanoplus alpinus* Seudder.**

Mammoth Hot Springs, Yellowstone Park, 6,500 feet, Aug. 5, 1 ♂.

This specimen has been compared with material from the Big Horn Mountains, Wyoming, and found to agree in all important characters.

The specimen was taken on the summit of the first hill back of the Mammoth Hot Springs Hotel. The ground in that locality was bare, being but sparsely overgrown with short grasses. At the time, the specimen was not noticed to be a desirable insect, and a search for others was consequently not made.

***Melanoplus infantilis* Seudder.**

Livingston, Park Co., Montana, Aug. 4, 1 ♀. Electric, Park Co., Colorado, Aug. 4, 1 ♀. Mammoth Hot Springs, Yellowstone Park, Aug. 5: at 6,215 feet, 3 ♂, 1 ♀; at 6,500 feet, 2 ♂, 1 ♀. Knob Hill Colorado Springs, Colorado, Aug. 22, 1 ♀. Cripple Creek, Teller Co., Colorado, Aug. 19, 1 ♂.

The Cripple Creek specimen of this diminutive species is smaller than the Yellowstone males, while the Livingston specimen is more grayish than any of the others.

This species was found chiefly in the more hilly regions where vegetation was not luxuriant and it was nowhere abundant.

***Melanoplus minor* (Seudder).**

Knob Hill, Colorado Springs, Colorado, Aug. 17, 1 ♂. Manitou, Colorado, Aug. 23: at 6,300 feet, 1 ♂, at 6,700 feet, 8 ♂, 6 ♀. One female from Manitou has the caudal tibiae dull purplish red, all other specimens having these parts various shades of glaucous.

With one exception all the specimens of this species were taken on

the steep hillside near the cog-wheel railway station. Orthoptera were not very abundant, but sufficiently plentiful to make collecting among the mountain-loving plants interesting.

**Melanoplus differentialis** (Thomas).

Knob Hill, Colorado Springs, Colorado, Aug. 18, 1 ♀. Roggen, Weld Co., Colorado, Aug. 24, 1 ♂. Fort Morgan, Morgan Co., Colorado, Aug. 24, 1 ♀. St. Louis, Missouri, Aug. 27, 2 ♂.

Very few specimens of this species were seen in Colorado. At St. Louis, however, the weeds in every vacant field were filled with them.

**Melanoplus bivittatus** (Say).

Gray Cliff, Sweet Grass Co., Montana, Aug. 4, 1 ♂. Livingston, Park Co., Montana, Aug. 4, 1 ♂. Muir, Bozeman Tunnel, Gallatin-Park Co., Montana, Aug. 12, 1 ♂. Sappington, Gallatin Co., Montana, Aug. 12, 1 ♂. Mammoth Hot Springs, Yellowstone Park, Aug. 5, 1 ♂, 1 ♀. Summit foothill of Gallatin range, 7,000 feet, Mammoth Hot Springs, Aug. 5, 1 ♀. Alfalfa field, five miles south of Salt Lake City, Utah, Aug. 13, 4 ♂, 3 ♀. Knob Hill, Colorado Springs, Colorado, Aug. 18, 1 ♂. Garden of the Gods, Colorado, Aug. 19 and 23, 1 ♂, 1 ♀. Fort Morgan, Morgan Co., Colorado, Aug. 24, 4 ♂, 2 ♀. Roggen, Weld Co., Colorado, Aug. 24, 1 ♀.

This species was more widely distributed than any other taken. Although nowhere found in swarms, it was almost invariably plentiful about the grasses and weeds growing in somewhat damp locations.

**DACTYLOTUM** Charpentier.

**Dactylotum pictum** (Thomas).

Garden of the Gods, Colorado, Aug. 17, 1 ♂, 5 ♀, 4 nymphs. Aug. 19, 4 ♂, 1 ♀, 3 nymphs.

This species was found in a slightly moist grassy meadow. Considerable time was occupied in searching for specimens and all adults and nymphs met with were taken.

**TETTIGONIDÆ.**

**SCUDDERIA** Stål.

**Scudderia furcata** Brunner.

Manitou, Colorado, 6,900 feet, Aug. 23, 2 ♂, 3 ♀.

Taken in the oak thickets on the hillside. The species was quite plentiful, but took to flight very readily.

**ORCHELIMUM** Serville.

**Orchelimum vulgare** Harris.

St. Louis, Missouri, Aug. 27, 8 ♂.

Taken in a vacant lot overgrown with weeds. The species was abundant everywhere in this locality.

**Orohelimum longipenne** Scudder.

Hannibal, Missouri, Aug. 25, 1 ♂.

This specimen agrees very well with Redtenbacher's description and measurements of his *inermis*, which he proposed to replace *longipenne*. Scudder's original description is brief and unsatisfactory.

The brownish marking on the dorsum of the pronotum is rather pale and nearly uniform in color, the lateral bars being extremely weak.

This single specimen was taken from high weeds growing on the banks of the Mississippi river.

**XIPHIDION** Serville.

**Xiphidion fasciatum** (DeGeer).

Akron, Washington Co., Colorado, Aug. 21, 1 ♀. Roggen, Weld Co., Colorado, Aug. 24, 1 ♀.

**Xiphidion saltans** Scudder.

Knob Hill, Colorado Springs, Colorado, Aug. 17-22, 4 ♂, 3 ♀. Garden of the Gods, Colorado, Aug. 19, 1 ♀. Roggen, Weld Co., Colorado, Aug. 24, 1 ♂.

The specimen from Roggen is very much paler than the others, the normal green on the sides of the head, pronotum and pleura being replaced with bluish white.

These insects were all taken among the grasses growing in moist locations.

**Xiphidion strictum** Scudder.

St. Louis, Missouri, Aug. 27, 2 ♂, 2 ♀.

These specimens have been compared with specimens of this species from Nebraska determined by Bruner.

The specimens were taken from a weedy field.

**ANABRUS** Haldeman.

**Anabrus simplex** Haldeman.

Mammoth Hot Springs, Yellowstone Park, Aug. 5, 5 ♂, 4 ♀. Knob Hill, Colorado Springs, Colorado, Aug. 22, 2 ♀.

These specimens have been examined by Mr. Caudell and are considered true *simplex* by him.

This species was extremely common in the sage-brush about the Mammoth Hot Springs. The males sit on the highest twigs and keep up a continuous droning z-r-r-r-r—somewhat resembling the sounds

produced by *Orchelimum vulgare*. When alarmed the insects fairly tumble from their perch and hurriedly seek their holes at the plant's roots. So quickly can these apparently clumsy insects reach their holes that it is only possible to surprise them still in the bush by approaching with the greatest caution. The insects are exceedingly poor at jumping and are completely helpless when removed from their home bush.

**Anabrus coloradus** Thomas.

Manitou, Colorado, Aug. 23, 4 ♂, 2 ♀. Hillside at 6,700 feet, Manitou, Aug. 16, 1 ♀. Halfway House, Pike's Peak, Aug., 2 ♂. Mountain View, Pike's Peak, 9,700 feet, Aug. 20, 1 ♂.

These specimens have also been examined and determined by Mr. Caudell.

These insects were all taken from low bushes growing in or near the woods on the slopes of Pike's Peak. Their stridulations were quite long.

**STEIROXYS** Herman.

**Steiroxys trilineata** (Thomas).

Muir, Bozeman Tunnel, Gallatin-Park Co., Montana, Aug. 12, 1 ♀. Mammoth Hot Springs, Yellowstone Park, Aug. 5, 3 ♀. Summit of foothill of Gallatin range, Mammoth Hot Springs, Yellowstone Park, 7,000 feet, Aug. 5, 2 ♀. Near Grand Cañon, Yellowstone Park, Aug. 10, 2 ♀. Yellowstone Lake, Yellowstone Park, Aug. 7, 2 ♀.

Most of these specimens would by the rather uniform dorsal face of their abdomen be referred to *pallidipalpus*, but the authors do not consider the blackish V-shaped maculations of the abdomen constant enough to use for the separation of the two "forms."

This species was somewhat plentiful under sage-brush. They inhabited holes at the roots of these bushes, in which they sought refuge upon the least sign of danger. They hopped along awkwardly, but disappeared in their holes with surprising speed.

**EREMOPEDES** Scudder.

**Eremopedes balli** Caudell.

Austin Bluffs, Colorado Springs, Colorado, Aug. 18, 1 ♂. Prairie land, Colorado Springs, Aug. 18, 2 ♀.

This species was previously known only from Fort Collins, Colorado, and Williams and Flagstaff, Arizona. This species was found on the ground among grasses. It is strictly terrestrial.

**GRYLLIDÆ.****NEMOBIUS** Serville.**Nemobius fasciatus** (DeGeer).

Mammoth Hot Springs, Yellowstone Park, Aug. 5, 2 ♂, 2 ♀. Geyser crust, Old Faithful, Upper Geyser Basin, Yellowstone Park, Aug. 7, 1 ♂, 1 ♀. Five miles south of Salt Lake City, Utah, in alfalfa field, Aug. 13, 1 ♂. St. Louis, Missouri, Aug. 27, 1 ♀.

All specimens in this series are brachypterous.

**GRYLLUS** Linnæus.**Gryllus pennsylvanicus** Burmeister.

On geyser formation at the upper end of Mammoth Hot Springs, Yellowstone Park, Aug. 5, 2 ♀. Brush, Morgan Co., Colorado, Aug. 24, 1 ♀. St. Louis, Missouri, Aug. 27, 1 ♀.

The specimens are brachypterous.

The specimens taken at the Hot Springs were lying dead on the geyser formation, evidently killed by the fumes issuing from a nearby vent hole.

**ECANTHUS** Serville.**Ecanthus quadripunctatus** Beutenmüller.

Knob Hill, Colorado Springs, Aug. 18-22, 5 ♂. Prairie land, Colorado Springs, Aug. 18, 1 ♂. Garden of the Gods, Colorado, Aug. 17, 1 ♂.

The antennal maculations, particularly on the proximal joint, vary considerably in shape, in one specimen approaching *fasciatus* and in others approaching *pini*.

A common species on the higher weeds and bushes growing on the prairie. Their low but continuous stridulating would be heard often many yards away.